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POPULAR MECHANICS MAGAZINE

WITH WHICH IS INCORPORATED THE ILLUSTRATED WORLD

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK GREAT BRITAIN. No. 410426 REG. U.S. PAT. OFF.

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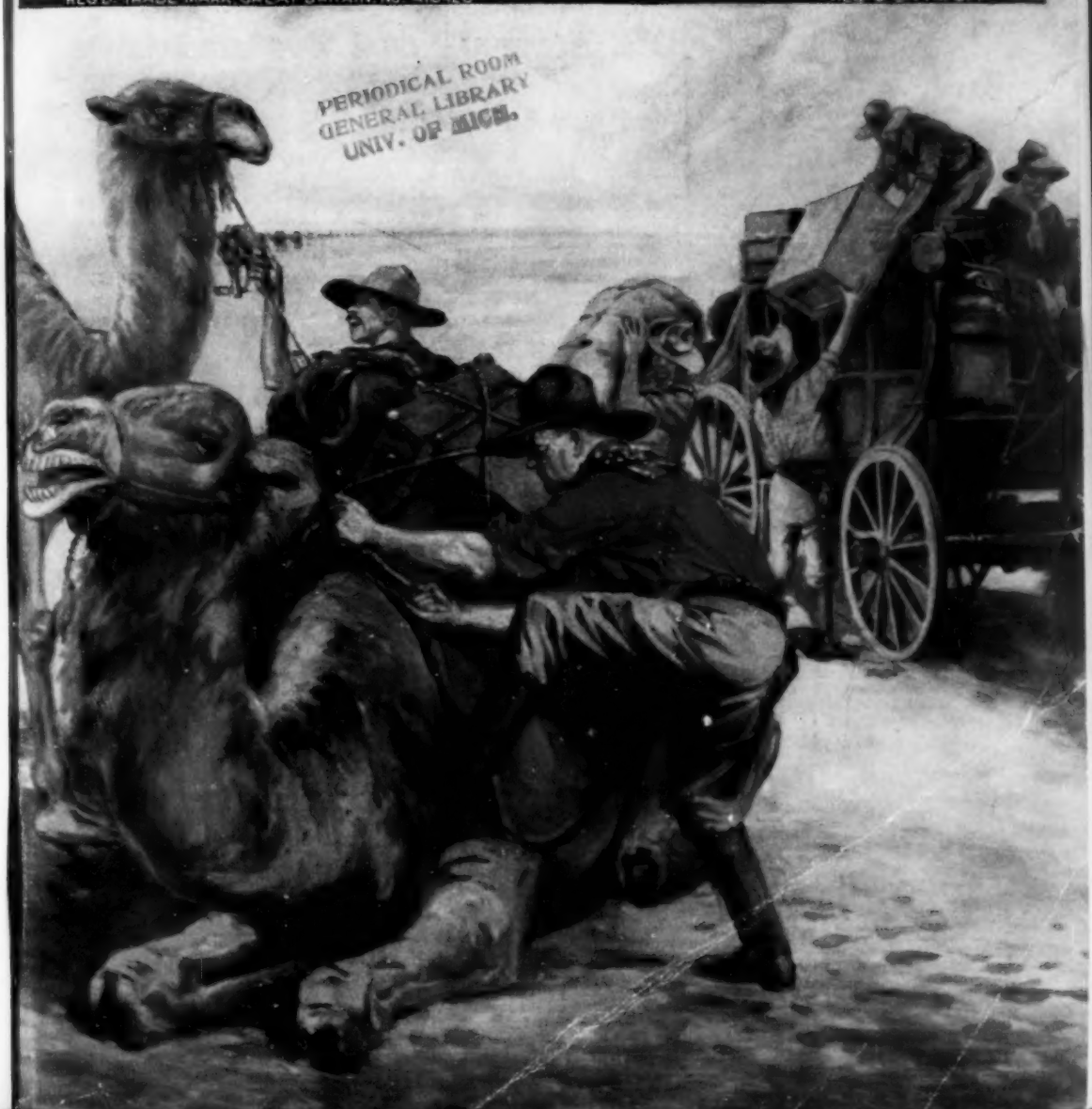
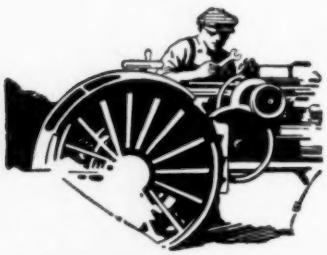


It takes *only* 8 weeks to get a big job

O. H. Justus owns a big agency and repair shop at Parkersburg, W. Va. He says "that my schools give motor secrets that will put any man 'on easy street.'"



Emanuel Rushfeldt, Alberta, says: "Earning $10 a day and only 20 years old."

W. W. Peace gets $250 a month and expenses operating a tractor in the oil fields.

Louis Beimer at 24 was made foreman over men many years older. That's not luck—*it's Rahe training.*

In the Auto and Tractor Business

Read what these men are doing—here is your big chance to get "on easy street." Come to these great shops on the biggest FREE offer ever made.

Big Firms Need Trained Men

The Auto and Tractor Business is on the boom. Thousands of trained men will be needed during the next few months. I get calls every day from Garages, Battery Stations, Auto Repair, Welding Shops and other successful concerns for Rahe men. When the big fellows need high grade men they know where to come for them. They want Rahe trained men.

MY TRAINING UNUSUAL

Scientific tool training—that's the secret. You do things here according to the latest engineering standards. Thousands of dollars have been spent in modern tools and equipments. That's why my men are at home in the biggest shops in the country. If you want to succeed the way Beimer and Justus and the rest have—qualify by the same method in only eight weeks or stay as long as you like.

I'll Pay Your Railroad Fare and Board You

SAVE $50 to $75

In order to fill the openings that now exist, I am making an offer no one has ever made before—**Free Railroad Fare, Free Board for eight weeks.** You Save Big Money by acting now. Pack your grip—get on a train—Come to school right now before it is too late **—OR WRITE TODAY.**

Send for FREE Book

My big illustrated training book tells how others are succeeding. It tells many things you ought to know about Autos and Tractors. Write for it and my **short time** offer NOW. It soon expires.

Rahe Auto & Tractor Schools

CHICAGO **Dept. 906** **CINCINNATI**
4445 Grand Blvd. **Ninth and Walnut**

RAHE AUTO & TRACTOR SCHOOLS, Dept. 906
[address school nearest you]
4445 Grand Blvd., Chicago, Illinois or **Ninth & Walnut, Cincinnati, Ohio.**

Without any obligation, send me your big free book, "The Evolution of Transportation." Also information regarding special temporary offer.

Name .....

Street .....

City ..... State .....

Don't Envy Tom Perkins

-do what he did!

Tom Perkins liked the good things of life—he liked to attend the theatre; he liked to wear good clothes; he liked to have a nice home and drive a good car. He liked all these—but that was as far as he got. He did not have the money to buy them.

His wife liked the good things of life too—she liked silk stockings and sealskin coats; she liked to live in a cozy little home of her own; she liked the things that make life worth living. She liked all these—but she had to depend on Tom, and Tom couldn't earn them for her.

Tom tried. He always had a job of one kind or another—and he always gave an honest day's work for an honest day's pay. What more could he do? Was it any fault of his that he could never earn more than just enough to buy himself and his family the bare necessities of life?

The turning point in Tom's career came quite unexpectedly. A boyhood friend, who had lived in the same town several years before, came back for a visit and told Tom what a great success he had made in the garage business as the result of taking practical training at the M. S. A. S. in Detroit, the automobile center. Then and there Tom decided to investigate the possibilities in the automobile field himself—and he was greatly surprised at what he found.

A Wonderful Business

He found, among other things, that the automobile industry is the third largest business in the country today. He found that there are twelve million cars and trucks in use in the United States alone and that the automobile factories are adding to this number at the rate of about ten thousand every day. He found that as the number of automobiles increased, more and more work was piling up for automobile mechanics to do. And, most important of all, so far as he was concerned he found that the men who had trained themselves for this work were among the highest paid men in any line of industry.

Here, then, was a line of work that offered a real chance to get ahead in the world. There were jobs enough and to spare for all the men that the automobile training schools could turn out for years to come. And there was no chance of failure—unless people should some day stop driving cars, and he couldn't imagine anything like that happening.

It struck Tom that this was a good business to get into. Within two weeks he had gone off to Detroit and to the M. S. A. S.—and it seemed only a short time until he had completed his training and had received his diploma.

$40 per Week to Start

When he returned home he went to the leading garage in the town, applied for a job, and got it—at $40 a week, more than he had ever earned before. For the first time in his life he felt that he was really on the road to success.

At the end of a month, his pay was raised to $55 and, in another month, it was again raised—to $75 a week. Tom was truly getting up in the world.

That was three years ago. Today Tom is the owner of his own garage and has two mechanics working for him. Besides, he has secured the agency for Chevrolet cars and Willard Storage Batteries and has built up one of the leading auto electric service stations in his section of the country. He has won for himself the reputation of knowing his business—and, as a consequence, he gets not only the bulk of automobile repair work in his own town but also a great deal of work from car owners in neighboring towns where there are no first class garages.

Tom's earnings now average $600 a month from the garage's repair work—and several times that amount from his sales of automobiles and batteries.

No Experience Necessary

But, you may say, Tom must have been an exceptional man—he must have known something about automobiles before he took the M. S. A. S. Course. Quite the contrary—he had had no experience at all in automobile work. In fact, he couldn't even drive an automobile at that time and, as he himself says, he didn't know the difference between a carburetor and a wheel-base—didn't even know a car had a wheel-base. The only difference between him and the other young fellows in his town who are still working at $15 to $25 a week is that Tom made a step to better himself. He got off the short ladder that he was trying to climb and got his foot on a tall ladder where there was room to do some real climbing.

Any young man can start climbing the automobile ladder that leads to money and success by doing just what Tom did. As soon as he heard about the big money-making opportunity in the automobile business, he wasted no time in investigating it.

Start Climbing Today

Do what Tom did—write today to the M. S. A. S. in Detroit for particulars about their course. All you have to do is fill out the coupon and mail it—and you will receive full information without charge.

The day that Tom first heard about the M. S. A. S. was the turning point in his life. This may be the turning point in yours—who knows? Mail the coupon today!

MICHIGAN STATE AUTOMOBILE SCHOOL
308 Auto Bldg., 3729 Woodward Avenue, DETROIT, MICHIGAN

Without expense or obligation to me, please send Outline of your Complete Automobile Course and tell me about men like Tom Perkins who have made a big success in life by becoming automobile experts.

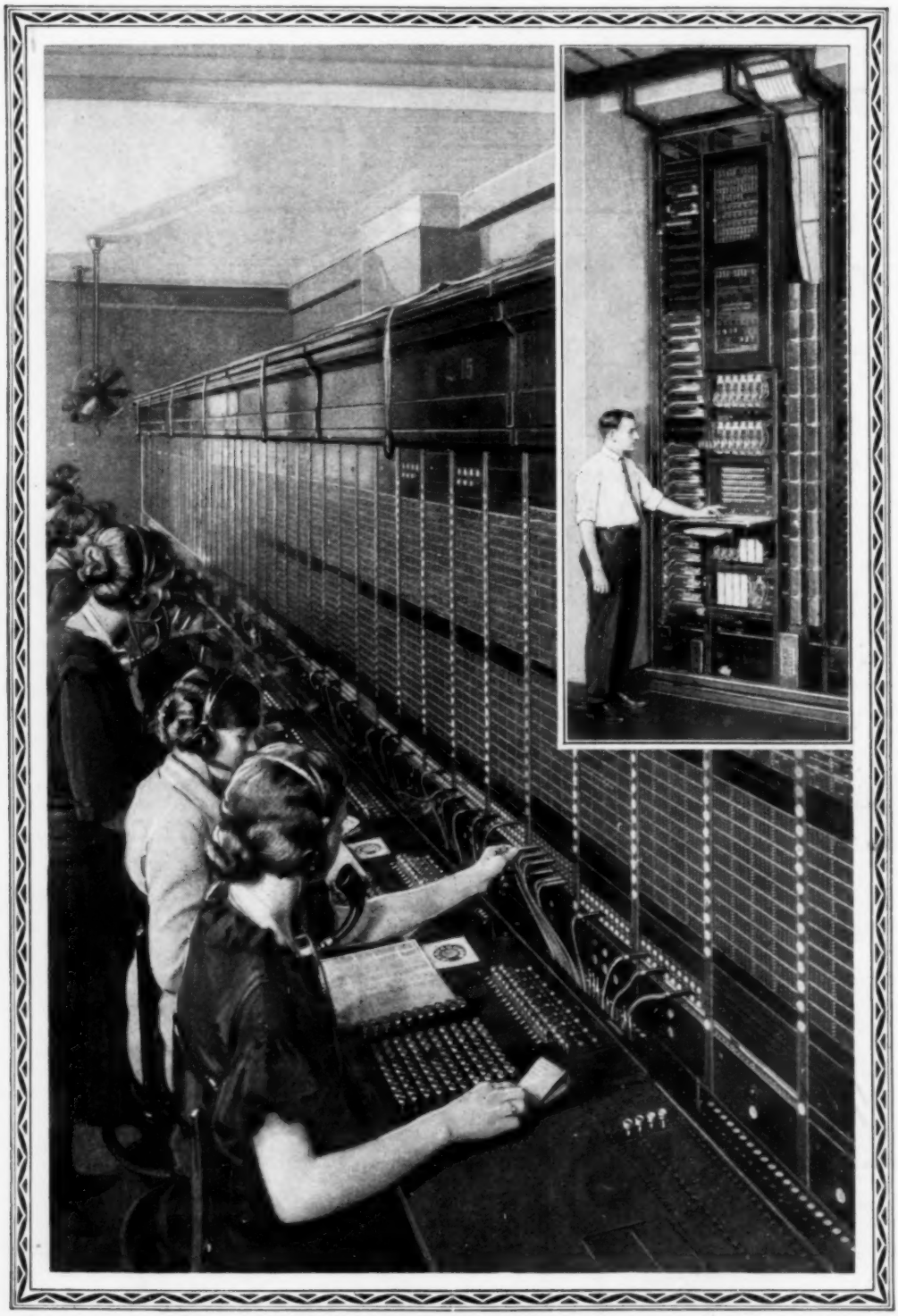
Name .....

St. or R. F. D. .....

City ..... State .....

Do you wish to start your course at Home or at our School in Detroit? .....

CHANGING FROM GIRL TO "GIRLLESS" TELEPHONES



Small Section of Old-Type Switchboard with Operators Who Tell Users How to Work New Dials; and, Above, Part of the Automatic, "Machine Switching" Apparatus

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LATEST MARVEL OF TELEPHONE SCIENCE IN USE

Phone Wonder Is Achievement of Hundreds of "Unknown" Minds

FOR one of the first times in the history of invention, a marvel of science has been developed as the work of hundreds of minds, rather than by one genius. This is the new system of telephony machine switching. Chicago was the latest city to adopt this wonderful system, changing 15,000 telephones to the "girlless" plan, but it will eventually be in use throughout the country. At the stroke of midnight a workman in grimy overalls threw a switch, and in 26 seconds nearly 3,000,000 residents of the city were given the result of the coöperation of hundreds of engineers, inventors, and scientists.

The new telephones are similar to the old automatic, which, strange to say, the small town is more familiar with than the big city. To each instrument a dial, with a movable top having a series of 10 finger holes, is attached. Under these holes are placed the numbers "1" to "9" and the "0," and in addition 24 letters of the alphabet arranged in series of threes. These run "ABC," "DEF," "GHI," etc., omitting "Q" and "Z." The letters are in black, and the numerals in red.

To make the description clear it is best to illustrate how the subscriber calls his number. Suppose the number wanted is Central 1470. On taking the receiver from the hook a subscriber listens until a faint buzzing sound is heard. This is the automatic's "number, please." He then places his finger in the hole in the dial which bears the black letters "ABC" and proceeds to pull the movable top to the right until he reaches a small hook which stops further pulling. On releasing his finger the top returns to its first position. He then goes through the same operation for "E" and "N." On completing these three he has registered on the machine the first three letters of the word "Central." He now proceeds in the same manner to call the number "1470." If his call is completed he, of course, gets his party, but if the line is busy he gets the usual signal. If he has made a mistake the operator in the central station immediately informs him of the fact. Each call, as will be seen, requires seven movements of the dial, three to obtain the exchange and then the four numerals making up the number.

How this marvelous apparatus works is of intense interest. In its simplest outline it may be described as follows:

When the subscriber begins to move the dial, a switch at the central station begins to place the call with a great deal more accuracy than a human being. The exchanges are so made that there can be no mistake if the subscriber uses the dial correctly. At first it is puzzling to understand how, when the user pulls down the "ABC" hole, for instance, the machine is going to register the letter that is to be selected, but by a clever study of names, those who perfected the system have chosen titles for the exchanges which permit the machine to select the desired letters.

When the subscriber pulls down

the three holes corresponding to "ABC," "DEF," and "MNO," the only possible exchange he could get would be "Central," as the combination of other letters made with the holes marked "ABC," "DEF," and "MNO" do not form the first three letters of any other exchange. Of course, after the exchange is obtained, the number, such as "1470," can only refer to one subscriber's telephone in that exchange.

After the exchange is registered on the machine, moving parts of the very complicated electrical switchboard pick out the line at that point. Now, in obtaining the "1470," when the figure "1" is pulled down, the phone is automatically connected with the 1000 group in the "Central" exchange. When the "4" is pulled the subscriber is then connected with the 400 group and so he now is in the 1400 group. When he pulls down "7" the machine selects the 70 group and when he pulls down the final "0" he is connected with "Central 1470."

Operators are Still Needed to Transfer Calls from the Old to the New System

As may be imagined, the solving of the problem of such an intricate system has taken many years. The general research staff of the telephone companies, numbering more than 2,000 experts and scientists, have had to develop all sorts of new material and new electrical appliances. Because of the great number of switches and other devices, which required, as a rule, the use of the very expensive metal platinum, the cost would have been prohibitive had not these research men developed new metal mixtures. They also had to produce a light combination of lead and antimony to cover cables in order that the capacity of local and long-distance lines could be made greater. Within these cables the size of the wires has been reduced almost to a vanishing point. Formerly, long-distance wires were as thick as a pencil; now they are about the size of a thread. A single cable of this new type may carry as many as 2,400 wires, and because of the light lead and antimony mixture used to cover the cable, the same telephone poles which used to be able to carry only one or two cables, can now carry a great many more.

This is only one of the many new things these scientists have discovered. Since beginning to work on the finer points of machine-switching telephony, more than $11,000,000 has been saved the telephone companies of the country through new metals alone. Then, too, the discoveries have been applied to the automobile industry and others, making for another enormous saving.

The change of 15,000 phones is, of course, just a beginning on the Chicago system, which now numbers 654,008 subscribers. While the change is being made, the numbers not equipped with the dial system will be obtained by the operators as heretofore. In making long-distance, emergency, and company calls the subscriber obtains service by simply pulling over the "operator" opening on the dial.

The greatest difficulty which the telephone company now faces is in educating the public in the way in which to use the system. First it was necessary to teach the telephone user to identify the exchanges by the first three letters of the name given them. Of course, each of the 654,008 subscribers could not be talked to personally and told how to do it, so the company for the last year has been printing in its telephone directory the first three letters of the exchange in capitals, as "CEN trl."

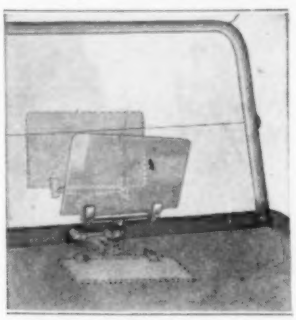
The idea of automatic telephones is almost as old as the switchboard itself. In the early '90s there were such systems, but they were not practical. For instance, Chicago had one, but could not run its wires overhead on poles, consequently it had to run its cables underground. This confined the use of the system to the down-town business section, and since everybody did not have one of the automatics it was hard to persuade a subscriber of the old system to adopt a new one. Consequently, while the machine worked almost perfectly, the company was unable to continue because of financial troubles. Also, when the number of subscribers ran to much more than 20,000 the entire equipment had to be duplicated, for the switchboards broke down very quickly.

RADIO SPEEDS UP TAKING OF MOVING PICTURES

Radio carried orders of the movie director to 5,000 members of the cast in a big scene in a western studio recently. Where, usually, the megaphone is used to shout instructions, while camera men are turning the cranks, this director, standing at a point from which he had a clear view of all the actors, spoke his orders calmly into a sending instrument, which made it heard clearly all over the lot. The directing, somewhat difficult because of the number of people employed, was simplified by use of radio, and the movie man predicted that it will be repeated in other big scenes. The same system was used to increase the carrying power of broadcast messages and concerts at the receiving end. Use of radio in this case not only spared the director's voice, but it produced better results by making it possible for all the actors quickly to go through with the scene without frequent stops.

NO GLARE TO AUTO DRIVER BEHIND NEW SHIELD

Auto drivers who use a new type of protector, attached in a few minutes to the top of the windshield, can smile at oncoming glaring headlights, for this new device tones them down to normal. It also gives protection against danger of sunlight in the driver's eyes and the glare of snow on the road. A small plate is fitted to the top of the windshield and, with a swivel joint, can be turned up to the roof of the car when not in use.



POISON-GAS TEST IS MADE IN THREE MINUTES

Simple tests to find the degree of poisoning from a gas known as carbon monoxide are now possible with the invention of an instrument that shows how much a person has been affected within

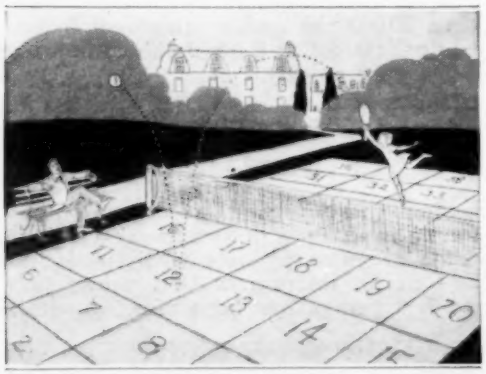
Girl being Tested with Instrument That Quickly Detects Poison Gas in Body

three minutes, where formerly it took from 24 to 48 hours before this could be accurately determined. The apparatus may be carried in the pocket and is expected to prove of particular value in mines, where this gas is a much-dreaded menace. Because of the compactness of the new instrument and the fact that it can be applied to a patient by one who has had no special training, it will be of broad general service, it is predicted. Government experts, who tried it on a young girl, assert that it is the quickest method known to detect the gas.

¶Transmission of radio signals of standard frequency has been begun by the Bureau of Standards, the range of wave lengths used being 600 to 300 meters. It also is planned to use higher frequencies to include the waves used by amateurs. The general call is given at 11:00 p. m., eastern time.

TENNIS COURT IN SQUARES TO TEACH ACCURACY

Looking like a great checkerboard, except that each square has a number, a tennis court has been devised to teach

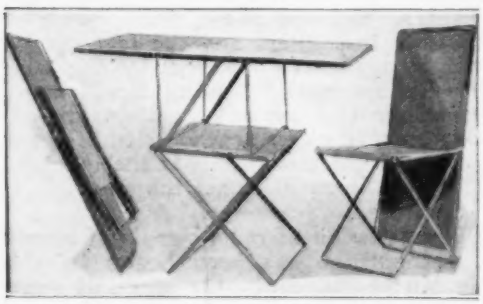


Tennis Player Improving Aim by Trying to Place Ball in Numbered Space Called by Teacher

accuracy. While an instructor calls out the numbers, the player is required to place the ball in the required section. The practice provides training not only for the hands and feet, but also for the mind, because of the quickness with which the numbers are called.

FOLDING CHAIR AND TABLE AN AID TO CAMPERS

For the convenience of vacationists, campers, motorists, and apartment dwellers, a combined chair and table has been made which folds flat into such small space that it may be easily carried. Built of metal, there are no parts to warp or break. After being used for a game of cards or a meal, it is quickly converted into a comfortable chair. It can also be



Combined Camp Chair and Table Which can be Changed or Folded Up in an Instant

used as an extra seat in an automobile, or packed with camp equipment.

ICE-CREAM CONE HOLDER MADE OF CARDBOARD

Ice-cream cones may be easily carried in a new holder, made of cardboard and designed by a New Jersey man. Holes are provided for the cones, and the sides may be used either as legs for supporting the device after it has been filled with cones or as handles for carrying it. As it is inexpensive, it may be given to every purchaser of a few cones.

FOLDING FENDER FOR AUTO SCOOPS UP VICTIMS

To prevent the front wheels of an auto from passing over the body of a victim, a new type of life net attached to the front bumper is being tested. It is carried, hidden from view, behind the bumper. From the driver's seat it can be quickly spread. The bumper drops to within a few inches of the street, spreading a canvas curtain, which is also raised at the same time to a height opposite the tops of the mudguards. This net is strongly built and will not tear, even if the unlucky walker is hurled into it with great force. It scoops him up and carries him along, frightened but unhurt, until the driver stops the car. The fender is worked by a mechanical device which either person in the front of the car can operate. Safety councils are testing it.

ARMY OF ANTS MARCHES BLINDLY IN CIRCLE

In watching the march of an army of ants, seeking a new home, a naturalist recently noted that, in many days and nights of constant moving, the insects had blindly tracked a circle more than a thousand feet around, and ended at the starting point. Urged by blind instinct, each one following the ant in front, bearing eggs and food for a new nest, they tramped along in a strong column, six lines wide at some places.

Along river sand, through a dense underbrush, up the bank, through a hollow log, they passed. Across a light jungle, around a small shack, and up to a large fallen log they continued in the insane march, ending in the very spot where they had started. Along the route many had weakened and dropped their burdens. The pace was slackened the second day, but on they went through sun and cloud, light and darkness, hour after hour. At last a half-dead ant broke ranks and moved away toward a beach, throwing the line behind him into confusion. Others followed and the lines were closed. The small army moved behind the new leader to a home.

GROWING GOLD WITH HELP OF BUGS IN WEST

With the aid of the ladybird beetle, California is growing a golden fruit crop the total value of which far exceeds the state's output of yellow metal. When thousands of adventurers braved the dangers of the western plains in '49 at the beckoning of a fortune to be wrested from the soil, none realized that in a few brief years farming and not mining would be the goal of their dreams.

Although oranges were not grown in California until 1873, the total value of the crop last year was estimated at $100,000,000, while the gold output amounted to only $14,829,100, so that the wealth from the orange trees of the state was greater than the gold dug from the soil.

The big results have been due to intensive study. For instance, a scientist, watching through a microscope, saw a beetle no larger than the eye of a needle pounce upon a newly hatched bug of a kind that was threatening the orchards with destruction, and devour it.

Immediately, an importation of ladybirds, the name of the beetle, was ordered, and ever since they have been at work protecting the fruit crop.

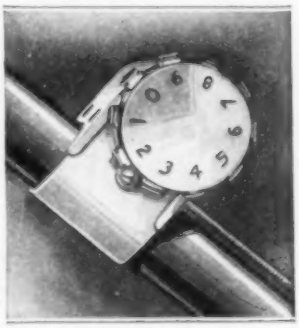
LEGS ON CLOTHES BASKET AT TOUCH ON HANDLE

Four sturdy legs have been put on a clothes basket by an inventor. These supports, normally, are folded away under the basket, but at a touch of the finger tips on springs near the handles, they let down, giving a solid table support for the heavy hamper. When it is raised, they automatically fold up again. It is claimed that this does away with tiresome stooping, spoiling of clothes from setting the basket on dusty ground, or the carrying of mud and snow on its bottom into the house.

Right: Legs of Basket Unfolding; Left: Release Spring in Handle

KEYLESS AUTO LOCK ACTS WHEN CAR IS STOPPED

Besides automatically blocking the ignition when the car is stopped, a keyless automobile lock positively holds the steering gear. There are no keys to forget, as the device is fitted to the steering post and operates with 10 buttons. It may be set with any number up to 10, and the combination may be changed as often as desired. When a button is touched to shut off the ignition, the car is automatically locked and cannot be operated again until the combination is worked.



If There Were Any Inhabitants on the Planet Jupiter, This Picture Shows How the Night Sky, Ablaze with Silver Moons and Stars, Appears to Them

JUPITER'S NIGHT SKY ABLAZE WITH MANY MOONS

While the people of the earth have only one moon, inhabitants of the planet Jupiter have five or six silver crescents hanging in their evening sky simultaneously, and spectacular eclipses are frequent. In all, the planet is surrounded by nine moons, but the number visible at any one time depends on their positions, as they travel very quickly in their orbits. Since the law of their movement has been established, it has enabled seamen to obtain their longitude by observing the positions of the moons.

OLD-TIME WOODEN WARSHIPS LIVE LONGER THAN STEEL

Though built of steel the battleship of today does not last half as long as the wooden ship of a hundred years ago. The old-time frigate was made of sound oak fastened together with copper, and lasted for 40 years if no bad accidents happened to it. The iron-clad warship of today goes to the junk heap in less than 20 years from the time it is built. There are four stages in the life of the armored vessel. It takes about five years to build it. Then, for five more years, it is classed as a great fighting machine. After that, new ideas put it out of date and back to the rear squadrons. For a few years before target practice sinks it, this floating fortress is given special duty, which takes it out of the battle line.

ALLIGATORS RAISED ON FARM FOR SHOE LEATHER

Raising alligators has become an industry, their hides having been found suitable for making shoes and other

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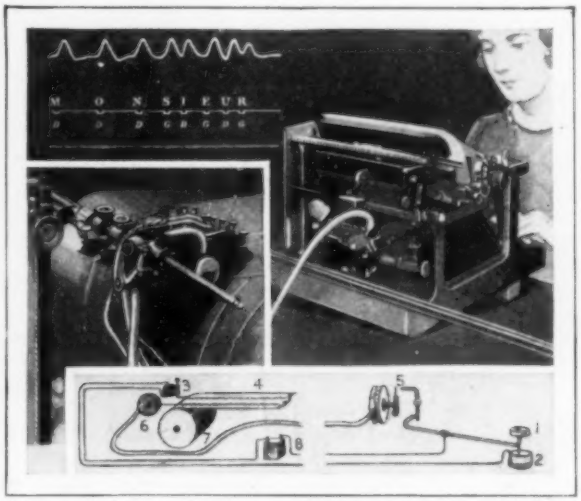
Alligators on Farm Where They are Raised to Provide Supply of Valuable Leather

leather articles. While in the North they are to be seen only in zoos, in several of the southern states entire "farms" are devoted to their care. Although the teeth of these creatures and their powerful jaws look most formidable, those who handle them dread most a blow from their powerful tails. When provoked, they first seek to strike and stun their victim before attacking with their teeth.

¶ Electricity is now supplying about 65 per cent of the industrial energy used in the United States, engineers estimate.

BEST WAY OF TYPING SHOWN BY TESTS

In working out better and quicker methods of typewriting French scientists have used an air tube attached to a moving drum which indicates the force, time, rapidity, and rhythm of the touch on the keys. It also shows which letters are the most frequently used. The apparatus on which the record is made operates by electricity. After a careful study of the results obtained, a new system of arranging the keyboard was worked out, whereby letters, which formerly required more time to strike because of their position, were brought closer together, and other slight changes made.



Air and Electric Apparatus, and Record Made in Seeking Quicker Typewriting Methods

AIR FROM TANK ON BACK USED TO SAVE LIVES

For miners, firemen, and others who sometimes are cut off from fresh air, small tanks with a two-hour supply of

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Oxygen Tank and Helmet So Light That They may be Easily Carried by a Girl

oxygen are being made. Weighing 36 pounds, they can be carried on the back. Due to its light weight and compact form, the miner can wear this breath-giving tank with ease while he works. There is no network of tubes and pipes to be disarranged and nothing to interfere with movement of the legs and arms. A fireman using it may enter a smoke-filled building without fear, as it will provide a constant supply of pure air. A number of the tanks in various parts of a mine provide an element of safety for the workers in case of accident. In a recent test the tank was used for nearly two hours by a young woman who felt no discomfort.

RADIO ON TOP OF THE ALPS TO GIVE WIDER RANGE

Instead of building steel towers, a radio firm is planning to stretch a wire cable between two lofty peaks of the Alps, in Bavaria, with which to receive and send wireless messages. Water power will be used to furnish the electric current. Because of the great height and the length of the aerial, its ends will be attached to devices like wagons weighted with stones. These heavy weights will take up and balance the effect of wind pressure. The peaks are easily reached from one side, but next to the valley they are almost straight up and down, which is supposed to make the location a good one for the experiment. Two wave lengths will be used, a short one for near-by points, and a longer one with which it is hoped the station will reach places now out of the radius of the greatest wireless plants of the world. With fair weather the builders expect to have this giant radio finished in a few months and be able to set new distance records.

LIFE-SAVING SUIT TO KEEP EIGHT PERSONS AFLOAT

Made of rubber, a life-saving suit which, it is claimed, will support eight persons besides the wearer in the water, has been devised by Capt. George Bray, who "shot" the Niagara Rapids in 1897. He says that the suit can be donned, ready for use, in one minute and without the removal of shoes or clothing.

ARM REST FOR MOTORISTS FOLDS INTO SEATS

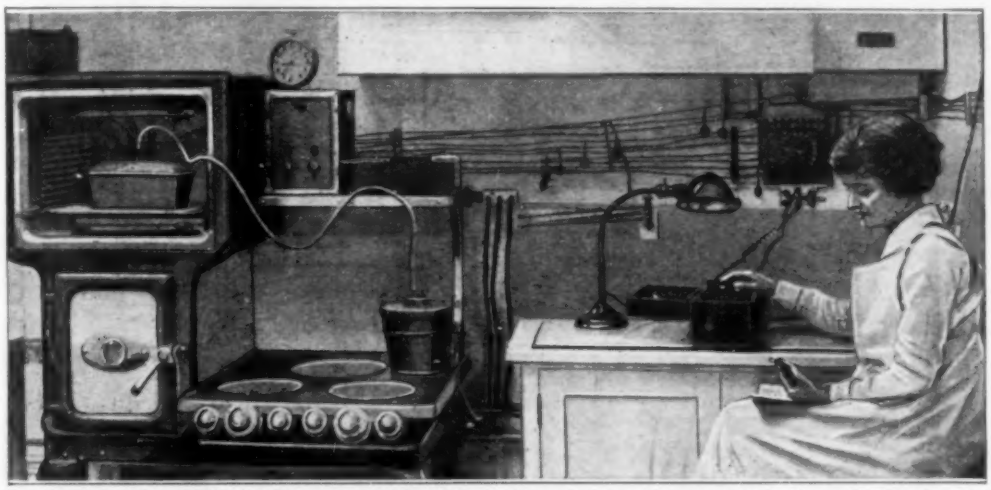
Dividing each seating compartment in an automobile into two parts when desired, a folding arm rest reduces fatigue by providing support for the arms of the driver and passengers. When not in use, it disappears from view, folding back into the seat cushions. Although most car owners prefer a seat without divisions for general service on long tours, the lack of support for the right arm of the man at the wheel has been found to be tiring.

Rest for Auto Driver's Arm, Which Folds Back into Cushions When Desired

With the disappearing rest, motorists may enjoy the advantages of both the single and double seats.

U. S. KEEPS TAB ON HEAT INSIDE BAKING BREAD

Heat inside a loaf of baking bread is carefully noted by government experts in one of numerous cooking tests. Through a series of such experiments, the temperature at which bread is properly baked is being sought. With a complex electrical apparatus, scientists watch progress of baking as heat is increased. An end of the recorder is thrust into the loaf. To find the correct cooking heat for various other foods, similar methods are used. Dialing of thermometers for stoves, that shut off the gas or sound an alarm when the desired temperature has been reached, depends upon such tests.



Electrical Machine Made by Government Scientists to Record Exact Temperature inside a Baking Loaf of Bread for the Information of the Busy Housewife

ANTS HELP BUGS TO STEAL MAN'S SUGAR SUPPLY

Man's continual battle against harmful insects that destroy his food supply is seen in a curious plotting between ants and the mealy bug, a tiny pest, to consume the cane-sugar crop in the South. So serious is the menace that a poison campaign is being conducted by the federal and state governments to kill ants that assist the bugs. The mealy bug feeds upon tender parts of the sugar cane and kills or weakens the young shoots. Enemies, known as parasites, kept down the number of the bugs until the ants arrived. Then trouble began. With their taste for the honey-dew secretion of the bugs, these ants became defenders of the pest, building mud barns to protect them.

RADIO EYE SENDS MOVING PICTURE THROUGH AIR

In a recent test before government scientists, pictures of a moving hand and other objects were transmitted by radio when they were held in front of a device known as an "eye." Witnesses declared they saw reproduced on a small cardboard screen in an adjoining room, the movements of the fingers as the inventor or his assistants "wiggled" them before the transmitter. The reproduction was said to have been somewhat indistinct but unmistakable. Improvements now in course of completion will bring out sharply the transmitted "movie," it is expected, and the prediction was made that the near future would see radio motion pictures in the home become one of the most popular pastimes of the world. The distance to which the pictures may be sent is said to be limited only by the capacity of the sending station.

GUM TURNED INTO RUBBER IN THIRTY MINUTES

By the use of two different gases, raw rubber has been vulcanized in about half an hour. As the work is carried on at ordinary temperatures, it is possible to utilize filling materials and coloring which will not withstand the high temperatures needed in the ordinary vulcanizing process. At present the process is being applied to the manufacture of materials for boots and shoes, and for bookbinding and upholstery.

"Eagle Boat" That Barely Escaped Plunge over Niagara Falls by Stranding on Sunken Rocks in the Rapids: Unaware of Their Danger, After They had Turned in the Wrong Direction on a Trip to Buffalo, the Crew Waved Greetings Back to the Horrified Spectators Who were Trying to Warn Them

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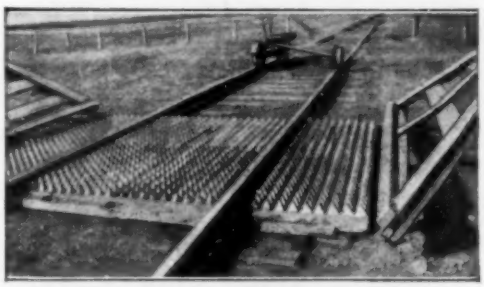
"EAGLE BOAT" IN CLUTCHES OF NIAGARA FALLS

Few thrilling escapes from death in going over Niagara Falls equal that of the crew of the "eagle boat" "Sunbeam," which landed on sunken rocks recently when heading straight for the Horseshoe Falls. It had been purchased from the government by a western man, who intended to use it as a yacht, and was being taken from New York to Chicago, going up the Hudson River and then through the barge canal to the Niagara River. Here, instead of turning to the west, the boat's owners, mistaking the way, headed straight for the falls. Unaware of their danger, those on board the craft were swept along in the strong current toward the falls. People on the shore made frantic efforts to attract the attention of the crew. Whistles were blown and every possible warning given, but the eagle boat plunged on into the upper rapids. It was only prevented from going over the falls by lodging on the rocks, and the voyagers were rescued by scows and boats attached to the bank by ropes. Later the boat drifted farther down the river and hung on a rock just back of the brink.

CONCRETE CATTLE GUARD CAN'T BURN OR BEND

To keep cattle off its tracks a western railroad is using a guard made of con-



Spiked Cones on Heavy Concrete Slab Keep Cattle off Railway Tracks

crete. It is a flat slab with small cones on the top. Through the cones are passed spikes. When cattle step on these, they quickly get off and decide that the meadow affords a more pleasant place to walk. The pointed ends of the spikes are exposed about ½ inch above the concrete. Being of concrete, the guards, of course, cannot burn or bend, nor can they be torn up or carried away because of their weight.

STOVE CUTS OFF THE HEAT WHEN FOOD IS COOKED

Just a glimpse of the future is given the housewife by an electrical stove that, in appearance, is just an attractive cabi-

Electric Stove Which Automatically Reduces the Amount of Heat as the Cooking Progresses

net raised on four legs. After the food is prepared, it is placed in the stove and the covers closed. A touch of a button starts the cooking. After the food is partly done, an automatic control shuts off the current and the cooking continues, only a trifle slower than when the current is on. The control device is said to save watching and waiting, and to govern automatically the amount of current needed to cook any article of food, shutting off the electricity according to the kind of food being cooked.

MILK-BOTTLE CAP LIFTER SANITARY AND USEFUL

To protect the contents of a milk bottle and to enable the contents to be easily poured, a cap has been devised which fits over the neck of any bottle. There is a hinge and spring on the cover so it may be easily lifted with the finger.

LETTERS SORTED BY MACHINE DIRECTLY INTO BAGS

Labor of a large number of mail clerks is saved by use of a machine which sorts letters and places them into the correct

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Machine That Does Work of Several Clerks in Sorting Letters into Bags by Cities and States

bags for shipment. The machine, now being tried by the post office at Washington, D. C., separates letters and routes them into sacks much more quickly than is done in the old way and with less expense. Five men, seated before keyboards like the typewriter, run the sorter, pressing two keys to send a letter directly into the outgoing bag. Use of the invention means almost no handling of mail and a saving of space.

RARE STAMP FOUND IN ITALY AFTER A LONG SEARCH

One of the rarest of early United States stamps, issued in 1845, recently was discovered in Italy where it has been hidden for more than 75 years. It is valued at $7,500. Made in Baltimore in 1845, when James M. Buchanan was postmaster, it preceded government issues of 5 and 10-cent stamps. So far as known, there are only six specimens of this issue in existence, and at a Paris sale last year one of these stamps was bought for $6,600 by an American. The stamp found in Italy is said to be distinguished from all other known copies because it shows all of the four outside border lines. It has been cut from the original envelope, but a large piece of the cover has been retained and it is canceled with a small ink mark and the last two letters of the word "Paid."

MOVING TRAFFIC IS WEIGHED BY SCALES IN THE ROAD

To show the worth of improved highways, government experts have made an automatic device for recording traffic, which shows not only the number of vehicles passing over the road, but also their weight. When installed, there is no delay in traffic, as the machine is hidden under the road bed and is covered with concrete slabs, over which the vehicles pass. In this way it is hoped to obtain a comparative record of the cost of moving vehicles and commodities over dirt and hard roads.

SAND SPRINKLERS IN INDIA RIDE ON THE ENGINES

Among the many queer customs in India, the land of contrasts, is that of having natives ride on the fenders of the locomotives in some sections to sprinkle sand on the tracks. Lifting the heavy bags of sand under a blazing sun is such strenuous work that they have to be changed frequently, but they object to having the automatic sprinklers used, and declare this would leave them with nothing to do. As labor is so inexpensive in India, the railroads have con-

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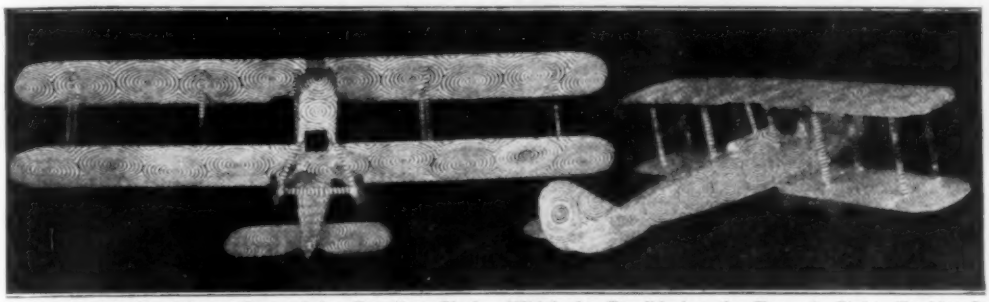
Primitive Way in Which Sand is Sprinkled on the Railway Tracks in Parts of India

tinued this primitive method instead of installing machines to handle the sand as is done in other countries.

DAZZLE-PAINTED AIRPLANE CONFUSES THE EYES

Having its wings painted in queer circular designs on the order of bull's-eye targets, makes the sight of a flying machine hard on the eyes. This new camouflage was tried out recently and was said to be a big improvement over that used in the late war. The circles are grouped in such a way that they cause the eyes to become confused because of their tendency to follow the scrolled lines instead of taking in the airplane as a whole. It is claimed that it would make the ship a poor target for an enemy, either in the air or on the ground. Previously army air craft were covered with silver foil so that they would appear to fade into the clouds, and, in addition, tinted with brightly colored squares and triangles to hide them when not in flight. Sometimes the under parts were painted to conceal them from watchers looking upward and the top would have an entirely different kind of design in order to deceive the hostile flier above.



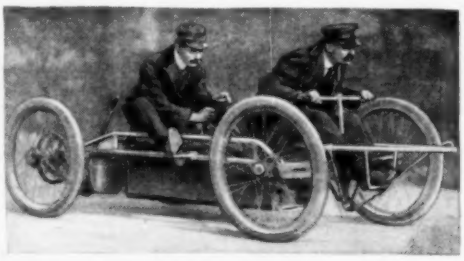
Airplane with Its Wings Covered by Dazzling Circles Which, by Bewildering the Enemy's Sight, Enables It to Escape Unharmed in an Aerial Encounter

MEN COST LESS THAN GAS FOR PUMPS IN INDIA

Labor in India costs so little that instead of putting in devices that require steam or gas to keep them going, natives are hired to do the work of belts and engines. Near Madras there is a water well which is called upon to give a great amount of service to passing travelers. Notwithstanding this, the water is lifted by man power. Over the well a rude derrick of rough-trimmed poles has been built. One of the poles is balanced on an upright, with one of its ends over the well opening. Attached to it is a bucket carried on a rope. Two men walking along this beam give it the weight necessary to raise the bucket. This method of securing water has been used in India for countless generations, the natives opposing any new idea that might rob them of work.

Labor Is So Cheap in India That Man Power is Still Largely Used in Preference to Machinery and Modern Devices

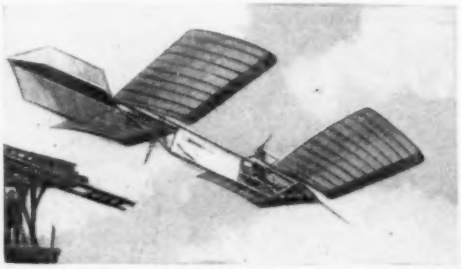
Twenty Years Ago in Popular Mechanics



Making Mile in 63 Seconds

"While the machine refuses to fly, it readily sinks itself in the water, and, by adding cork, would make a good submarine. Built on the model of a bird, it partakes more of the characteristics of a fish."

1902 Comment on First Plane



Launching Langley's Air Craft

IN all the millions of years since the coming of man—ages spent in struggling up from the sea to the sands, fleeing before glacial drifts, battling ferociously against strange monsters and the terrifying forces of nature—no other period has seen such great advancement as the last 20 years, according to scientists.

In these two brief decades, human beings have cast aside the shackles binding them to earth and have penetrated into the sky above and the sea beneath. And yet, in 1903, Langley, now known as the "father of aviation," was being derided as an impractical dreamer following the failure of his first airplane and its fall into the Potomac River.

During the same year, according to the files of Popular Mechanics, an electric automobile established a record by covering a mile in 63 seconds, big Chicago hotels just began to install telephones in their guest rooms "to supplant messenger boys."

In addition, the British navy was experimenting with its first submarine, and a "terror of the deep," a submersible, operated by one man who worked the propeller with his feet, was being tested in the United States.

"Latest Terror of the Deep" in 1902

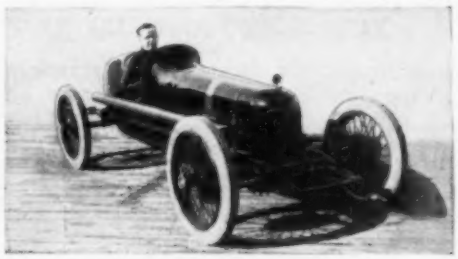
Seen as Promise of New Era of Wonders

AIRPLANES able to lift tons, like the giant "bomber" just built for the United States Army, were not even dreamed of, and automobiles able to maintain a speed well over a hundred miles an hour, were years in the future.

Although the French navy had drawn the plans of a submarine run by steam on the surface and by electric motors when submerged, inventors and marine engineers in 1903 never even contemplated the possibility of crossing the Atlantic Ocean in an underwater boat—a feat successfully accomplished during the war.

And yet the seed of the tremendous achievements which were to mark the next few years was there, for Popular Mechanics, in referring to a "sky cycle," a combination of a balloon and a bicycle, designed to carry one man, said: "It is by no means improbable that within the next ten years vehicles for aerial travel will be as common as automobiles today."

Viewing the future in the light of the accomplishments of the past, scientists are predicting a new era of even more wonderful achievements. Perfection of the submarine, airplane, and automobile all offer fresh incentives to the inventor.

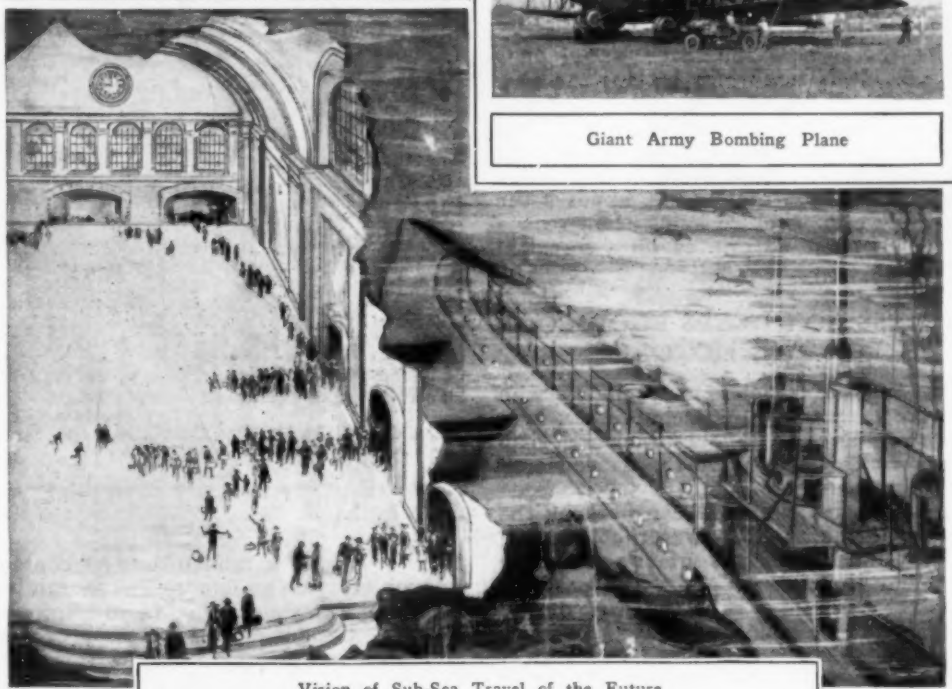


Racing Automobile of 1923

"Smaller motors, greater speed, lighter cars built of new alloys which will run 70 to 80 miles to the gallon of fuel—this is the automobile of the future and it will cost far less than anything known today."

Forecast of Future Motor Car

Giant Army Bombing Plane



Vision of Sub-Sea Travel of the Future

BABY MOVIE CAMERA TAKES FULL-SIZE PICTURES

Moving-picture films of the standard size are used in a small camera now on

Film Rolls That may be Carried in Pocket are Used in This Camera

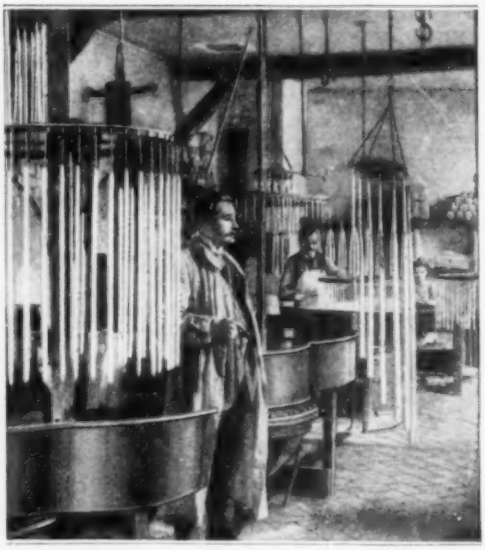
the market. The magazine holds nearly 100 feet of film. That is enough to make several short scenes. Extra film, in rolls not much larger than a watch, may be easily carried. The exposed film can be removed and replaced with an unused roll in open daylight. To obtain the best results, the camera should be placed on a tripod. It is not necessary for the user to have a knowledge of developing and printing of film, because in most large cities there are studios where this is done at small cost. This movie camera, like those used by professionals, exposes the negative film. Before being shown on a screen it must be printed on a so-called positive.

ICELESS BOX KEEPS FOOD COOL FOR THE MOTORIST

Automobile travelers and campers who are far away from any icehouse can supply themselves with cold water and keep foods cool, if they have the flax-covered cooling chest now on the market. Bags made of flax have long been used by the desert people to keep water cold. The flax allows tiny beads of the water to seep out through its pores and pass off into the air. This robs the wall of the chest of heat, and thus lowers its temperature. The cooling chest has a steel box inside a flax-duck cover. There is enough space between cover and box to hold 4 gallons of water which is cooled by the evaporation. Food placed in the box will be kept cold by the water around it. Clamps are placed on the chest so that it can be fastened to the running board of an automobile.

MAKING TEN-FOOT CANDLES FOR USE IN CHURCHES

Though gas and electric light are generally used throughout the civilized world, the candlemaker is still busy at his trade. There is a shop in Europe where a large force of men and women is engaged all the time in making huge candles for use in churches and cathedrals and where great quantities of Christmas candles are made with machinery. Some of these church candles are 10 feet high. Although more than half a century has passed since candles for the home were made in kitchens, practically the same process is still used in this big shop. In some of the work of the candlemaker gas and electricity are



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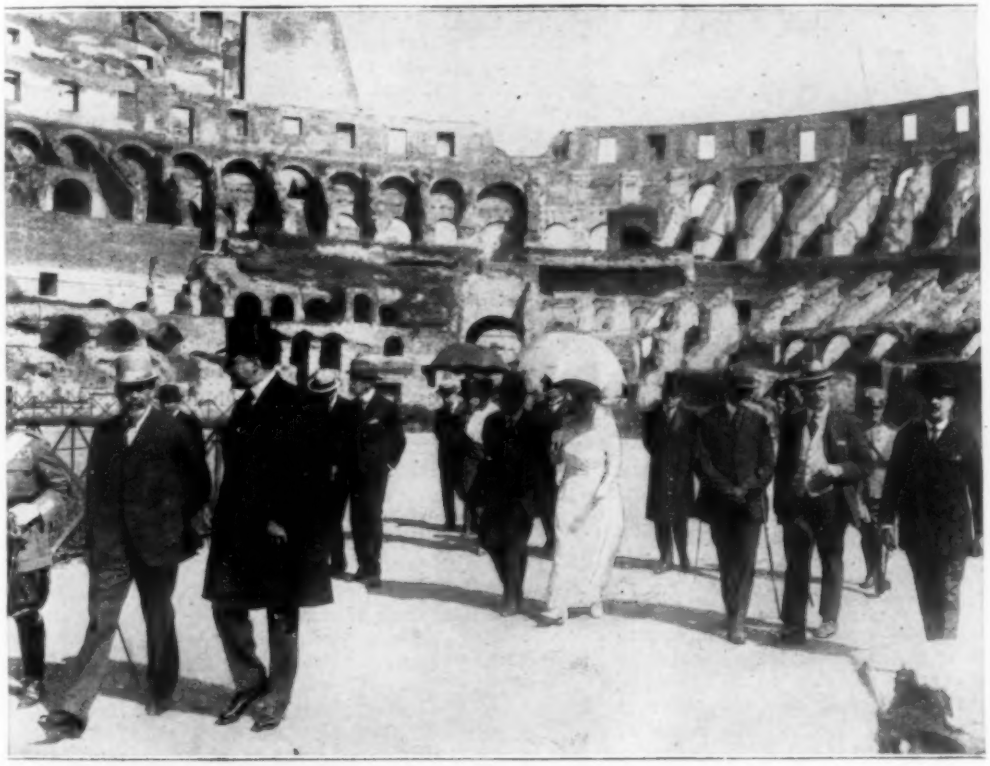
Where Gas, Which Replaced Candles in Home, Serves in Making Them for Cathedrals

employed where formerly everything was done by hand.

¶In order to establish closer contact with its outlying provinces, the Dominion of Canada may erect six radio plants in western Canada. The sites receiving favorable consideration are Forts Smith, Resolution, Simpson, Macpherson, and Norman, and Dawson City.

ENGLAND'S KING AND QUEEN VISIT THE COLOSSEUM

Monuments to the engineering skill of ancient Roman builders—structures that have defied the destructive processes of time through more than 18 centuries—were viewed by the king and queen of England during their recent visit to Italy. The majestic Colosseum, begun by Emperor Vespasian and dedicated by Titus in 80 A. D., the greater part of which is still standing, particularly impressed the royal party. Bound by metal clips, instead of mortar, many sections of the ruins stand as firmly today as when they were built. Ruins of the Baths of Caracalla, the Temple of Castor and Pollux, the Palace of the Vestal Virgins, and other buildings that constituted the old Roman Forum, bear mute evidence that ancient engineers knew how to build in a way that would defy the ravages of time.



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Rome's Colosseum, Which was Built About 80 A. D., So Strongly That the Greater Part of It is Still Standing, Viewed by the King and Queen of England on a Recent Visit to Italy

BURNING GAS TO MAKE ICE WITHOUT MOTOR

Burning gas to make ice sounds impossible, but that is what a device designed for use in connection with small refrigerators does. Placed in the basement, it will furnish refrigeration for three flats. The gas flame under a tank vaporizes a chemical that passes through several coils and extracts the heat from the refrigerators. Then it passes back to the tank, where it is again vaporized, and travels the same route as before. The operation of the machine is automatic, there are no moving parts, and it is perfectly silent. Once set at the temperature desired in the ice box, it requires no more attention. Besides, as the refrigeration is perfectly dry, it prolongs the life of the ice box indefinitely and keeps food pure and sweet for a longer period than is possible with ice. As there is practically no loss of the chemical used, the machine continues to operate as long as the flame remains lighted, and there are no parts to oil or adjustments of any kind to be made by the user.

PIG'S BRISTLE TO WATCHES IS PROGRESS OF TIME

Like many of the marvels of civilization, the watch has become so familiar that its perfection passes almost unnoticed by those who fail to realize that it is one of the most extraordinary things made by human hands.

Since the first caveman took a rope of grass, tied knots in it at equal distances, set fire to one end and measured the passing of the day by the burning from one knot to another, the development of time-telling devices has been full of fascination.

First Watch

Centuries later, time was told by candles notched at regular intervals. In the thirteenth century a rude clock was evolved, taking its name from the bells ("glocken" or "cloches") used to strike the hours. It was 300 years more before the first watch came. It was as large as a saucer, varied more than an hour a day, and sold for about $1,500 in our money.

Several generations then went by before the next radical innovation. This was the invention of a crude hairspring made of pig's bristle. Today this spring literally is as fine as a hair, and it is made by drawing steel wire through a hole in a diamond until it looks like a thread from a spider's web. A pound of steel used for this wire costs five or six dollars and makes eight miles of hairspring worth 62,000 dollars.

It requires 3,773 operations to make a watch containing 211 pieces, about one-third of which are screws. Some of these screws are so small that 20,000 will go into a thimble. Laid on a piece of paper, they look like gold dust or grains of pepper. Half a million of them will not weigh more than a pound. Scales to measure these screws are so delicate that they will weigh a pencil mark on a bit of tissue paper.

Ancient Clock

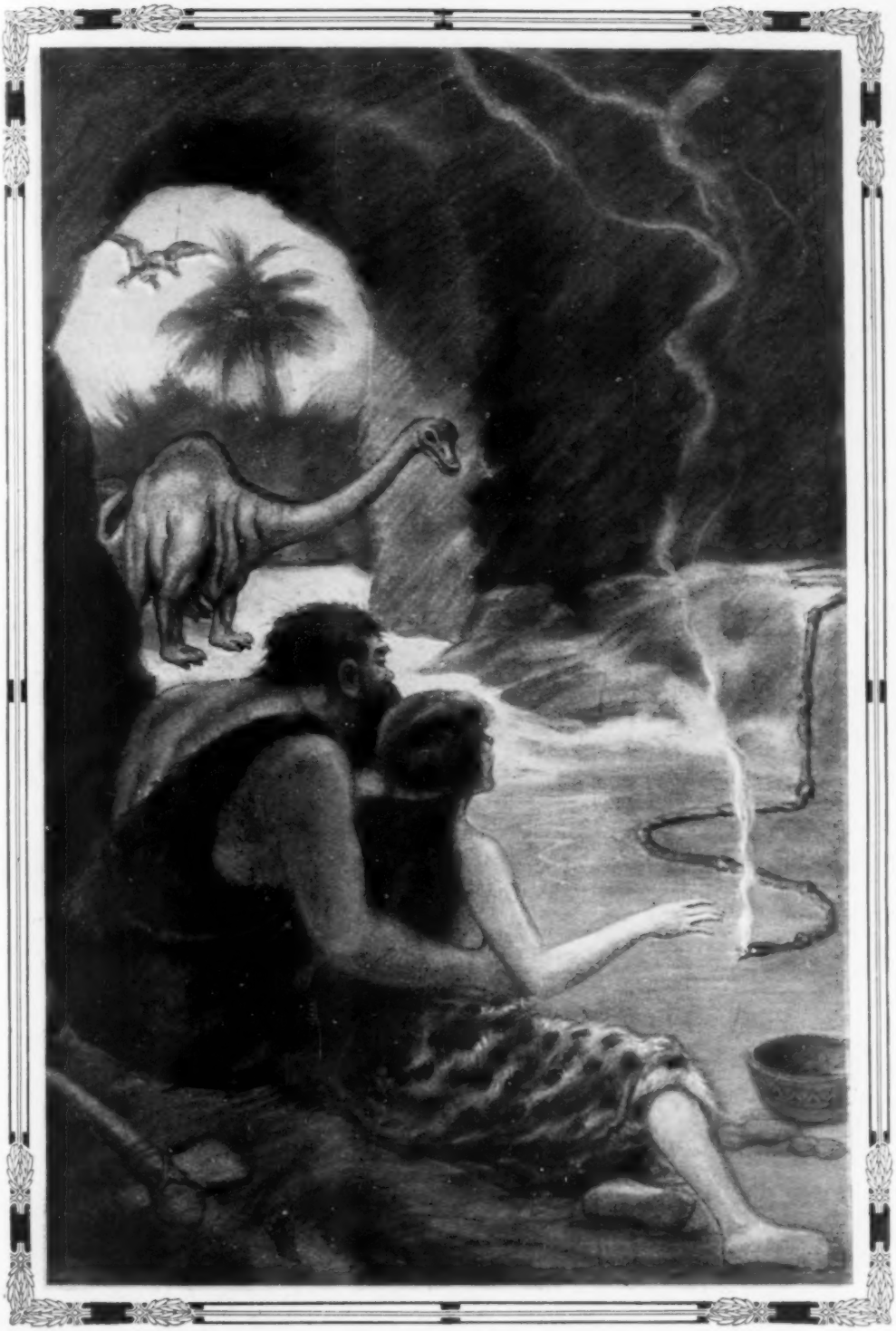
Jewels used for bearings are cut from rubies. They are just rough pebbles to begin with. Then they are cut into pieces thinner than ordinary writing paper, shaped into circles the size of a pinhead, and a hole is drilled through the center of each. The pivots of the gears turn in these pierced rubies, which are required to withstand 18,000 blows an hour and over 150,000 beats a year from the movement of the balance wheel, which is audible as the familiar "tick-tock."

All of the driving force of the watch lays in the mainspring, which is about 2 feet long, and yet, if suddenly released, it can strike a blow strong enough to put out the eyes of the person handling it. If a spring breaks, the watch will stop at once, but just why it breaks is a good deal of a mystery. Strangely enough, the best springs are most liable to breakage, while a comparatively soft spring, which will not keep good time, will last almost indefinitely. The spring should be wound in the morning, not at night, as then it is less sensitive to the jars it encounters during the day.

Many curious superstitions have grown up about watches. One is that the hands should never be turned backward. Experts say, however, that this will not injure any timepiece except one that strikes. Another concerns the big, painted, wooden watch which often hangs as a sign in front of jewelers' stores. The hands almost invariably point to about 18 minutes past eight.

Some persons believe that this is done because that was the hour Lincoln was shot. Others say it was the time he died. Neither explanation is correct. In the first place, he was shot much later in the evening than 8:18, and he died at 7:22 in the morning. The real reason for this custom is that this position of the hands leaves space for the store owner's name, besides giving a well-balanced appearance to the dial.

In cleaning watches a rare oil is used which comes from a cavity in the jawbone of the porpoise or the blackfish. Cape Cod fishermen bring in most of it. To be tested, the oil is taken up into Vermont, where the mercury goes far below zero in winter. The best grade is that which remains practically unchanged at these low temperatures. A single drop of this oil is enough to lubricate a watch for a year.



How Cave Dwellers, Countless Generations Ago, Kept Track of the Passing of Time by Watching the Slow Burning of a Knotted Rope Made of Twisted Grass

It required years of experimenting to develop this lubricant, as it was first used only in crude lamps.

At one of the great American watch factories, the time is kept on two master clocks sealed in air-tight cases. They rest on concrete piers to protect them from jars and are regulated by astronomers, who measure the time it takes the earth to turn on its axis. This turning is so regular that it does not vary even a hundredth of a second in a thousand years.

In Switzerland, long known as the watch center of the world, the making of timepieces was early developed as a household industry. Families specialized in making the different units, which afterward were sent to factories for adjustment and assembling. Now there are eight large factories in the United States, one of which alone turns out 1,000,000 watches yearly, approximately 8,000 timepieces daily, and the year's output is valued at about 15,000,000 dollars.

Time Ball

The most extraordinary of all the marvels in a modern watch is the balance. It is the heart of the watch. The adjustment of the balance wheel, and of the hairspring inside of it, is what makes a watch "keep time." Most watch trouble comes from some derangement of the balance.

After being wound into coils, the threadlike wire of which the hairspring is made is put into a chemical bath, from which it emerges looking like fine, brown hair. These coils are then tempered, or "blued," by being laid on a hot iron plate for a few seconds. Then they go to girl workers, who pick up each one with delicate tweezers, and fasten the end with a pin which is itself scarcely larger than a hair.

As to the balance wheel, the rim is formed by welding a circle of brass to the outer side of a circle of steel, the brass part being twice as thick as the steel part. This is done because brass expands more rapidly under heat than steel, so the brass is put outside and the rim is cut in two places, leaving open spaces.

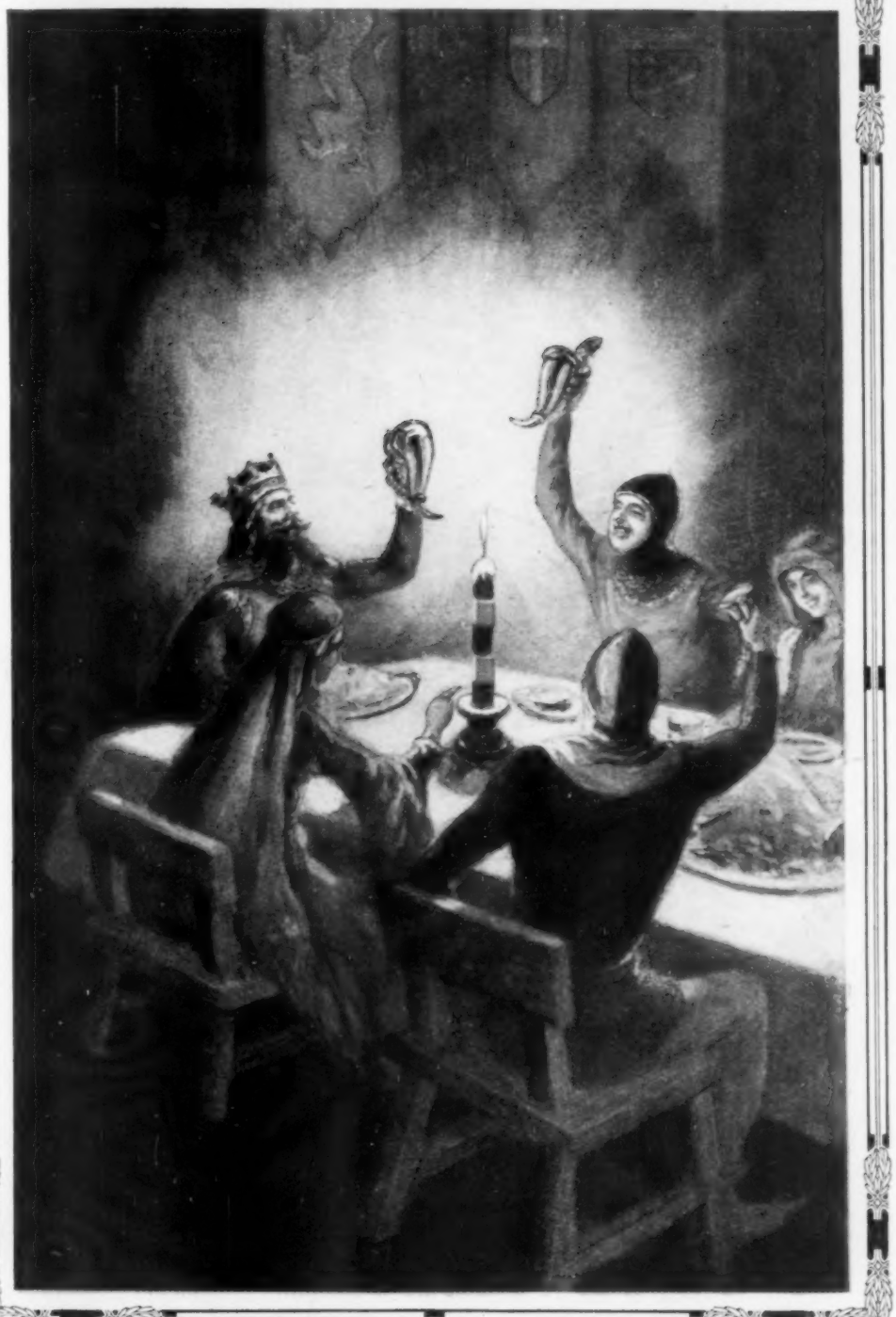
Then, when the brass expands, the steel draws the free ends inward, keeping the wheel the same size. As there would be a variation of only a few thousandths of an inch anyhow, this is an indication of the accuracy of adjustment required. In the rim of the balance wheel there are 26 holes. They are so small they look like mere black specks; yet each one of them is accurately grooved in a spiral thread to receive screws so small they are hardly visible to the naked eye.

At first, six of the little screws are put into six holes on each side of the wheel, twelve altogether. Then the wheel must be poised. To do this it is suspended between two small uprights with thin blades of garnet on top, and is made to revolve. If the wheel stops dead, the girl making the test knows that the weight of the wheel is evenly distributed around the rim. If it does not stop dead, but settles a trifle one way or the other, there must be a little extra weight somewhere, so other screws are substituted of slightly different weight, and this is continued until the wheel poises perfectly.

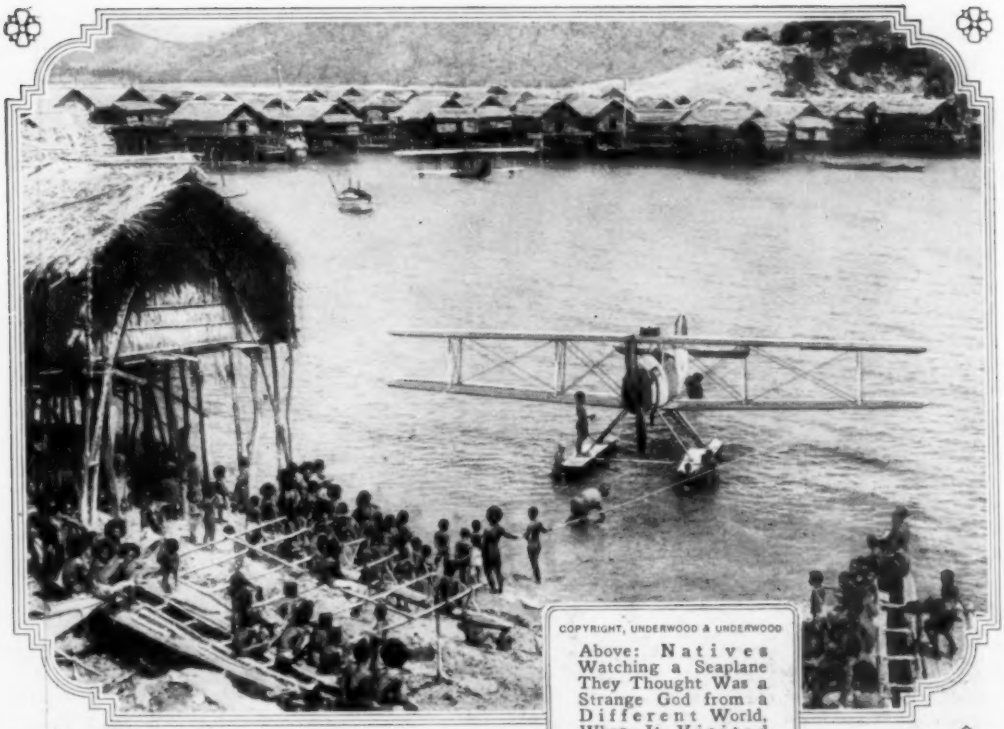
This process gives some idea of the accuracy necessary, but the process does not end here. After all of the parts of the watch are assembled, and the "movement" is ready to run, it is tested in various ways. A watch is expected to run the same, both summer and winter, so one of the tests is for temperature. The completed movement is kept running for 24 hours in an oven at a temperature of about 84 degrees; and then for another 24 hours in a box packed with ice.

If it is found to have gained, say two seconds at one temperature and to have lost five at another, that is considered a total error of seven seconds. The man who is "rating" the watch, takes out a pair of the little screws in the rim of the balance wheel and moves them to a hole or two farther along. Each of the twelve holes in the two sides of the rim has a number.

The watch rater may move the screws in the number eight holes to number five, and make a note of this change in his record book. Then he repeats the 24-hour tests at each temperature to see whether he has corrected the error. If he has not, he makes another change in the position of some of the screws, and tries the test again. But he keeps on until the watch runs the same at every temperature.



When Knighthood Was in Flower, the Time was Told by the Melting Away of Candles Which had been Notched to Represent the Hours of the Day



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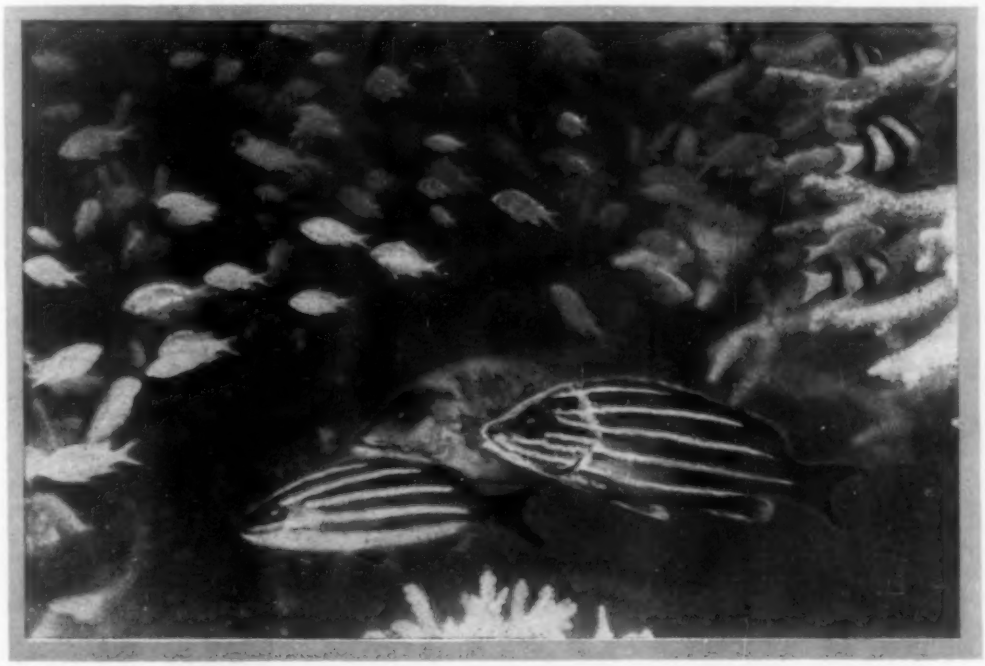
Above: Natives Watching a Seaplane They Thought Was a Strange God from a Different World, When It Visited Their Shores for the First Time. Below: Queer Grass Costumes Worn by Priests in Papua. On Ground in Foreground Is a "Bull-Roarer," a Device to Scare the Natives

SKY VOYAGERS GREETED AS GODS IN PAPUA

NATIVES of Papua, in New Guinea, who were recently visited by airplanes, thought the machines were strange gods, and so, to pay their respects, they solemnly carried pigs in canoes to the floating seaplanes and placed them as an offering upon the broad wings.

They are a very superstitious folk who in these days of scientific wonders still cling to magicians, rain makers, and sacred amulets. Thunder and lightning, and storms are the fury of evil spirits who have been insulted and must be appeased, they believe. Fearing the dead, where they dwell for a long time, hoping to throw their enemy spirits off the trail. On certain occasions priests don weird grass creations made to resemble alligators with open mouths, through which they make roaring sounds, believed by the terrorized people to be the voice of a dreaded spirit. These noises are produced by swinging so-called "bull-roarers," pieces of wood attached to string and swung round and round.

Boats made by the Papuans are much like modern airplanes, the great outriggers resembling somewhat the wings. Some of these boats are 50 feet long, and



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Strange Fish, Striped Like Zebras, Fleeing from Camera in Coral Bed: Remarkable Under-Water Picture Made by Scientist Visiting Papua

they cut pathways through miles of jungle to the open sea, so that the departed spirit can reach the water to bathe. Amulets are worn to bring success in war, in trading, hunting, fishing, or love.

These simple people believe that in them dwells a spirit that often goes abroad at night while they are sleeping, and that always roams the darkness after they have died. This ghost has great power over men, and at any time may return to plague those who have done it a wrong. When there is a plague, the Papuans flee the colony to the forests, when lashed together they often have a width of 25 feet. When the visitors from a modern city reached this primitive place they were surprised to see community apartment houses, rudely made, but 500 feet long and containing quarters for scores of families. All houses are built on high piles regardless of their distance from the sea. In front of these homes the women cook while the men are out hunting.

Most of the heavy work is done by the women, who get their reward in beads and other bright body ornaments. The

men wear very little. Sexes do not eat together. When friends meet, they do not shake hands, but they touch noses. In some parts of Papua acquaintances greet each other by pouring water on the head. The hair is bound with roots in tiny bunches; sometimes a young man has 700 such bunches on his head. They are called "frizzled-headed," which led to the name of Papua. On ceremonious occasions Papuans show their fondness for music, using Pan pipes, flutes, and drums. Rarely is there singing. Living in ignorance of the outside world, they still use the bow and arrow in hunting, yet develop a race of men who are taller, stronger, and healthier than the average in civilized lands.

FIVE-STORY OFFICE BUILDING ONLY TEN FEET WIDE

On a strip of ground only 10 feet wide, a London railway company has built one of the world's strangest structures—an office building so slender as to have the appearance of a blank wall. Standing as one of the architectural curiosities of the British capital, the building is five stories high. Bounded on one side by the street and on the other by railway tracks, there was no possibility of obtaining a larger section of land, and yet the narrow strip was so valuable that it could not be allowed to lie idle. Located near London Bridge, thousands of sight-seers visit the structure, which is filled with business offices. Usually the impression is that it is a "spite" building, but, in reality, it resulted from the owner's desire to find some way to help pay his taxes.

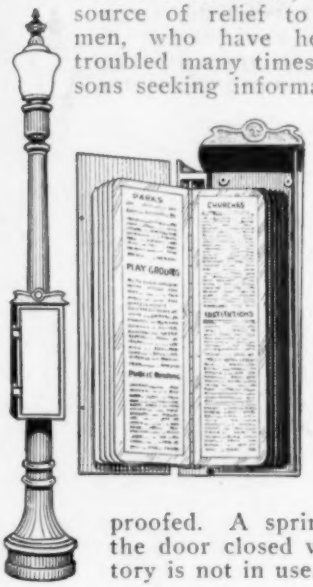
Office Building Which Looks Like a Wall, Built in London on Strip of Ground Only 10 Feet Wide

LIQUOR PLANT NOW SCHOOL FOR TRAINING BAKERS

Machines once used to test liquors are now, with a few changes, teaching bakers how to make bread and pastry in a trade school in the Middle West. The three-story building used by the liquor testers has been changed into a school for bakers, scientific devices in the laboratory formerly used for work with alcohol now serving students of the chemistry of baking, and the 5,000 books in the old liquor library being of value as texts on yeast and other products used by bakers. With very slight changes the pre-prohibition plant made a model college of bakers. In other parts of the country many similar incidents have resulted from the change of industry from a "wet" to a "dry" basis.

LAMP-POST DIRECTORY MAKES HANDY GUIDE

Condensed city directories, clamped to lamp-posts at convenient points in Pacific-coast cities, are proving a source of relief to traffic policemen, who have heretofore been troubled many times a day by persons seeking information. The directories are housed in a cast-aluminum box, similar to a fire-alarm box, and contain upward of 50 aluminum pages, each 6 inches wide by 20 inches deep. The printed matter on the pages is weather-proofed. A spring hinge keeps the door closed when the directory is not in use.



MODEL OF MOUNT RAINIER IS EXACT IN DETAIL

Complete in every detail, even to small wild flowers and stunted evergreens, is a model of Mt. Rainier, the tallest peak in the United States, which has just been finished by a Pacific-coast artist. The model stands 14 feet high and is built on the scale of one to 1,000. Two months' work by the artist and a crew of assistants was required to complete the work. The rock used for the crags and hills was obtained from Mt. Rainier, as were the larger evergreen trees. Smaller trees were made of yarn, while the blue of the ice fields and glaciers was made with colored paraffin. The model was cast in plaster and laid on canvas stretched over a wooden frame. Colored lights give the effect of sunshine or moonlight when thrown against the scene, giving it a life-like fidelity to nature.

Model of Mount Rainier, Just Completed by a Pacific-Coast Artist, Showing the Smallest Details: More than One and a Half Tons of Materials were Used

LIGHT FOUND TO BE ENEMY OF MUSEUM TREASURES

Museums of the future will have no windows, according to a noted scientist, who claims that light is the greatest enemy of natural-history collections. After a few days' exposure, it is declared, the lovely Luna moth fades, feathers of humming birds actually seem to disintegrate, and even some minerals are affected. This damage is attributed to the ultraviolet rays from the sun, and all attempts to filter them out through frosted or colored-glass windows have proved unsuccessful. In many of the larger museums, the most valuable collections are now closely guarded in rooms into which no ray of sunlight is ever permitted to shine. Inspection by the public is allowed only under artificial light. Abroad, sealed vaults are used to store the relics and they are seldom brought forth to be shown to visitors.

Great Stone Face on Ancient Temple Hidden for Untold Ages in Jungle Wilds: Lured by Its Smile, Scientists have Labored in Vain to Solve the Mystery of the Race upon Whose Splendor It Gazed.

GLORY OF LONG-LOST TEMPLE RESTORED

Jungle Splendor Tells Mute Story of Forgotten Race, Their Thousand-Year-Old Culture, and Wonderful Achievements

BY A. N. MIRZAOFF

TOWERING high above the surrounding jungle, an ancient temple has been restored by modern science to bear mute witness to the splendors of a forgotten city in Cambodia, French Indo-China. With miles of long corridors, a maze of marvelous carvings and bas-relief of rich and intricate designs, the temple combines in one solid mountain of carved stones French renaissance, Byzantine, Moorish, Hindu, and barbaric architecture.

Who were the architects, the draftsmen, the masons, and the slave laborers who piled this gigantic and bizarre mass of peaked towers, grotesque cupolas, hundreds of somber galleries, and thousands of steps and windings of the original temple, is a question which has not been answered. Some historians say the Hindus, while others claim it was a people subject to the Hindus. French scientists, however, have traced the date of the temple to about a thousand years ago. It was near a beautiful metropolis, known as Angkor Thom, or "Royal City."

This town was built in the form of a rectangular inclosure, nearly two miles in each direction, surrounded by walls from 40 to 50 feet high, and 50 massive towers decorated with the faces of ancient gods.

For hundreds of years these structures were lost in the thick and almost impassable tropical jungle. What was once the home of romance and Oriental splendor became the habitation of birds, beasts, and reptiles. Palaces in which kings had lived and died, stately columns and walls that had looked down on gorgeous gatherings, pavements which had resounded to the passing of mighty armies, crumbled slowly into dust, while those to whose genius they bore evidence vanished even from the pages of history.

After many decades of brooding silence, the ruins were discovered by Portuguese missionaries, but it was not until recent years that French scientists began delving among them in an effort to solve the mystery surrounding a forgotten race. Slowly the débris was cleared away and the reconstruction of the temple begun.

From the strange inscriptions and carvings covering the walls, efforts were made to learn something of the customs of the former inhabitants. It was found that, besides the first city, the ruins contained another, known as Angkor Wal, both being subject to the Khmer kings.

Pieced together by learned men, part of the records related to the dancing girls attached to the palace of the kings. Only the most beautiful girls, some of them as young as six years, were brought to the rulers by their parents.

After the parents had been paid according to the age and beauty of their children, the girls were imprisoned in the palace and never permitted to see their fathers or mothers again. They were immediately taken charge of for training by teachers, themselves former dancers to the king.

Every effort was made to make the girls not only dancers but actresses and acrobats as well. They were required to express not only music, but sentiment of their bygone glories, while burdened down with a load of from five to six pounds of gold, silver, jewelry, and long, pointed helmets, emblematic of the great temple.

In preparation for this they were required to endure a long and painful period of training, the object of which was to make the body supple and to maintain a steadiness of arm and leg movements in order to follow the rhythm of tom-tom music.

Sitting opposite each other, one of the girls would turn back the fingers of a companion until all of the joints cracked, and then bend an arm backward over a knee as a branch is broken. The aim of this was to obtain suppleness of the joints.

These rites and the training that goes with them are still practiced by the Cambodian court.

With the restoration of the temple, the French scientists are continuing their excavations in the hope of more exact details of life in this mysterious kingdom, and the fate of the original race which flourished there.

As many of the products of these ancient builders are the result of lost arts, it is hoped that a more thorough search than has yet been possible will prove of great advantage to both science and the study of the human race.

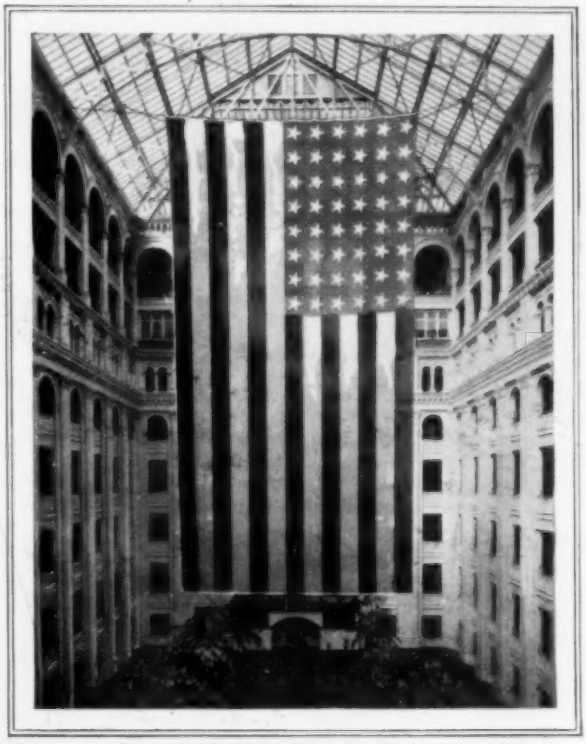
Dancing Girls of Khmer Kings Who Never Gaze Again upon the Faces of Their Parents after being Given to Their Ruler, When Mere Children, for Years of Rigorous Training in Preparation for Careers

Ruins of Temple in Forgotten City of Ancient Cambodia Which has been Partially Restored by Scientists as Mute Evidence of the Splendor and Power of a Race That Vanished Centuries Ago

Young Dancing Girls of the Khmer Kings being Presented with Jeweled and Golden Ornaments Worn during Their Efforts to Express the Spirit of Bygone Glories before Their Ruler

"OLD GLORY" TOO LONG, ITS SIZE IS CHANGED

"Old Glory" is to be changed. Science and art have tested the old flag and have decided that it is too long for its width. It is to be trimmed 1 inch for every 8 inches in length. This makes it about the same size as the one that was carried by Yankee troops in the American Revolution. It is the first change made in the flag since Arizona and New Mexico were admitted to the union more than a decade ago. Tests by art experts and government officials have been made on flagstaffs of various heights. The starry field of blue and the seven red and six white stripes have not been changed, though. Except for the additional stars, it is the same emblem honored by the nation since the days of Washington. What is thought to be the largest correct flag in the country is at the post office in Washington, D. C. This hangs from the roof of the inner square and spreads over six stories. The length is 70 feet 4 inches, and it is 37 feet wide.



United States Flag at Post Office in Washington, Said to Be Largest Correct Emblem in Country

STRANGE MYSTERY OF THE SEA IN SINKING OF STEAMER

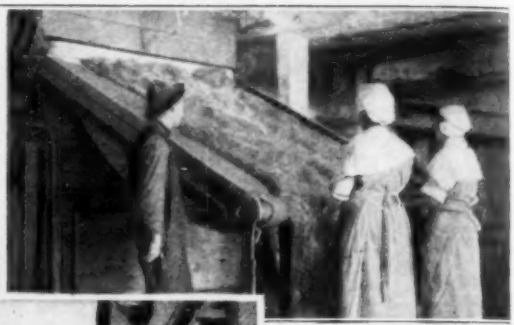
What is regarded as one of the strangest mysteries of the sea resulted from the sinking of the steamer "Seaconnet" in which several members of the crew lost their lives. Survivors declared that the vessel did not hit the bottom, nor have a collision, but that it simply sprung a leak, which they could not explain, and eventually foundered. They asserted they had seen no evidence before of weakness in the ship, and had every confidence in it. The captain said he had previously made two voyages across the western ocean in the "Seaconnet," which was formerly named the "Tuckahoe," on one of which he had successfully passed through 14 days of heavy gales without evidence of any leakage. Seamen and naval experts have manifested much interest in the case, but have been unable to offer any explanation. On the books of the underwriters it has been entered as one of the unsolvable mysteries of the deep, as the examination of the survivors failed to yield any clue.

TREE OLDER THAN ICE AGE MOVED FOR BUILDERS

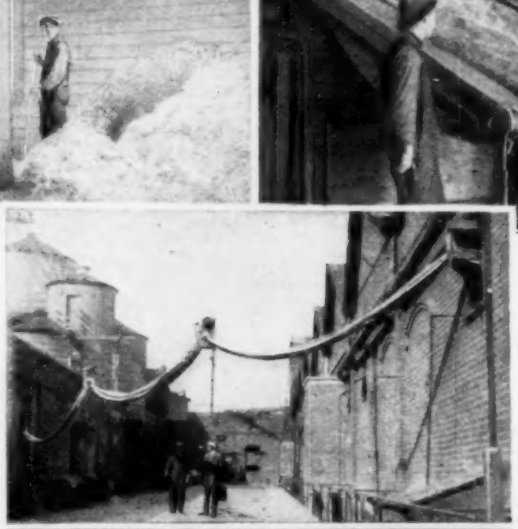
One of the oldest living things in the world, a ginkgo tree, was recently uprooted and moved in a middle-western city to give space for a modern hotel. The tree was again planted. Two years ago when a large house on the lot was moved, the owner ordered that the building be cut into two sections so that the life of the tree would be spared. Tree experts say that the ginkgo is a living fossil, the only member left of a family of trees that lived when terrible winged lizards roamed the earth, long before an ice floe destroyed them. Today the tree is no longer to be found in a wild state, but it is grown in gardens in China, Manchuria, and Japan.

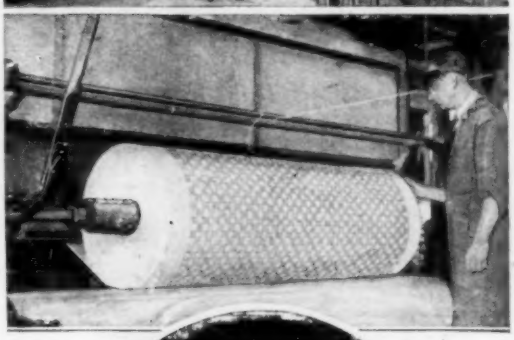
GERMS TURN CHINE GRASS INTO STRONG FABRIC

At Top, a Pile of Grass being Dried in Preparation for Putting in Tanks



Above, Machine Breaking Tough Fiber of Grass So That Germs may Penetrate It





Great armies of germs, inhabitants of a world invisible to the unaided human eye, have been put to work turning out cloth and fabrics of various grades and textures for the use of mankind, according to the announcement of a California scientist.

After three days and nights of work the germs become so tired that they must be given a period of rest and food before they can continue their labors.

For hundreds of years these germs have been used in the process of changing flax and similar plants into cloth, but it was only recently that they have been intensively cultivated for this purpose alone, which has resulted in a great saving in time.

Cloth on Way to Rollers and as It Looks Afterward

Previously, it required from three to six weeks to prepare the flax for weaving, but with the help of the armies of germs, this time has been cut down to from 60 to 96 hours. The germs often number as many as 2,000,000,000 to the cubic inch.

Under the old method, the flax was simply placed in tanks and the germs were slowly formed by fermentation. By the new process they are bred separately in tanks and then put to work in vast numbers converting the flax, being returned to the tanks for rest when they become tired.

The work of the germs is to rot the tough fibers of the flax or Chine grass, which is brought in great bales from China, until it is suitable for weaving.

After the germs have finished, the fiber goes to the looms, from which it comes forth as dress goods, table-cloths, towels, and other high-grade products. It is declared to be of superior quality and capable of withstanding the most severe service.

Rotted material remaining in the tanks has proved of value as food for cattle. Preparations are being made to apply the new process to the manufacture of cotton fabrics also.

CLOTHESLINES KEPT IN POST UNTIL THEY ARE NEEDED

By using a hollow iron post, a clothesline holder has been made that keeps the line out of the way when not in use. Each post carries four ropes which pull out and automatically return when released. The lines are easily pulled from the post and attached to any solid object. A tightener on the post prevents sagging. Always ready for use, the ropes are kept clean and out of the way, nothing being visible except the post. Less than a minute is needed to stretch the lines. Besides providing a clean clothesline, the holder adds to the neatness of a yard. When necessary, new ropes may be put in by removing a cover plate.

TORPEDOES TIED TO PLANES, LAUNCHED IN FLIGHT

Loading the seaplanes of the navy with giant torpedoes is a work calling for the utmost care. In transferring them to the flying machines they must be floated to a spot under the wings of the plane, from where they are lifted and tied to the framework. If the loading should take place in a rough sea much damage might be done by improper handling. The mechanism which causes the torpedo to

Passing Big Torpedoes to the Planes Has Excitement Enough for the Nerviest Sailor

explode when it strikes, is not fixed in position until it has been securely fastened, and is ready to be launched from the moving airplane.

¶Authority has been granted the regents of the Smithsonian Institution, by act of Congress, to prepare preliminary plans for a suitable fireproof structure, with granite fronts, for housing various valuable museum collections. The building is intended to hold the National Gallery of Art and the historical collections.

GIRLS' FACES "DONE OVER" SO THEY LOOK ALIKE

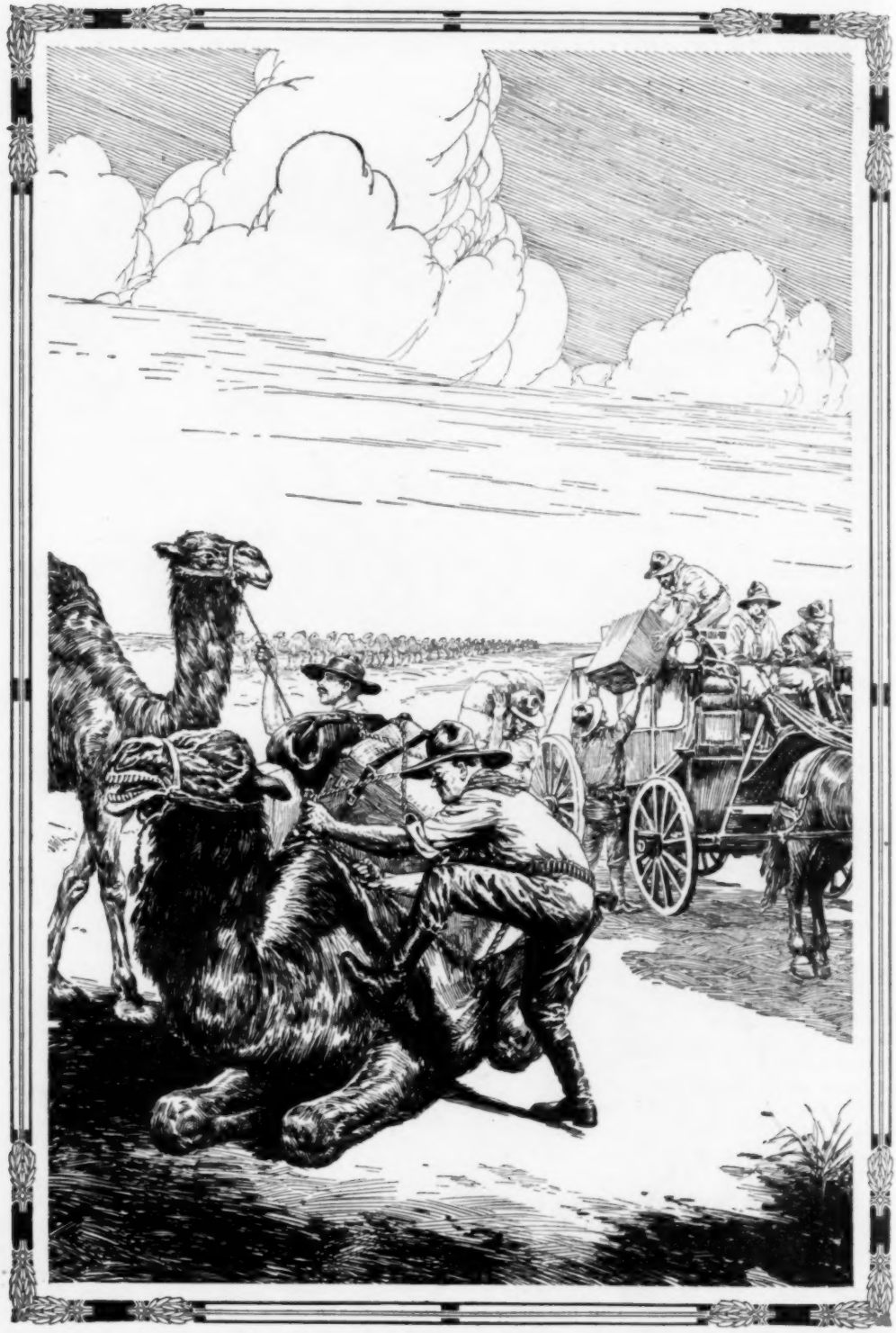
So-called "contortionable masks" have been used in the East to make 12 chorus girls look exactly alike. While every

Chorus Girls having Their Faces Fitted with Flexible Masks to Express Different Emotions

face appears similar, the masks are flexible so that any normal emotion may be expressed through them. In repose they may be made to represent beauty, sorrow, joy, or some grotesque character. Each one is molded to the face by a lengthy, secret process.

MYSTERY RADIO STOPS LINE OF AUTOS

Wireless waves coming from an unknown station have been used to halt a large fleet of automobiles in Germany. All of the cars were equipped with magnetos, and started out together. The run was made at night and reached far out into the country. After traveling for some time, a short halt was made at a little village. Starting again, the line of machines suddenly came to a dead stop. Every driver believed something was wrong with his car and stuck out his hand as a signal to those in the rear. It soon became known that all of the automobiles in the line had stopped as though by magic, and could not be started. This strange accident proved to be a test which was being made from a big radio station whose location was kept secret. At an appointed time it had sent out the special waves that were caused by a powerful apparatus of new invention. These waves interfered with the magneto, which stopped the cars. The mysterious test will also be applied to airplanes, electric trains, and even submarine boats.



Traveling over the Barren Plains of Australia Still is Done by Means of a Strange Combination of Vehicles. The "Ship of the Desert" and the Old-Fashioned Stagecoach Have Their Part in It

STAGECOACH AND CAMELS USED IN AUSTRALIA

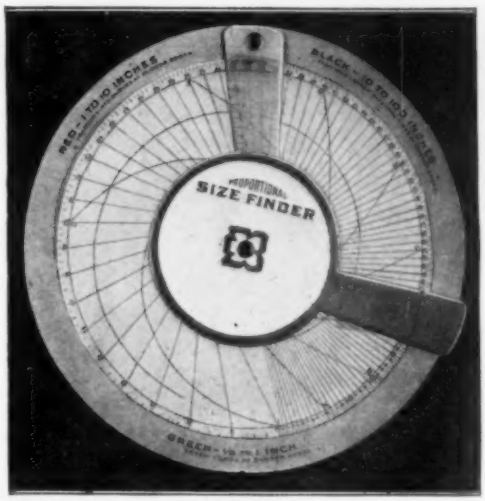
The interior of Australia covers so vast an area that only a small portion of it can be reached by those who prefer to travel only on railroads. In the early '50s an American started a line of coaches from Melbourne to Castlemaine. This was soon after gold was discovered. Since that time a network of coach routes has been built up, covering a large area. These link up the coast cities, situated on railroad lines, with the interior—the "back" country. A journey by coach is not always a pleasant experience in Australia. South Australia lays claim to the doubtful honor of what is called the "dead finish" in coach travel. This is a trip from Haddon Downs to Farina, some 404 miles, and the fare, one way, is $50. It is not a "de luxe" journey, as may be judged from the time-table, which states distinctly that "Female Passengers are .Not Carried." Nor is the coach used at all times by the travelers. One coach line notifies its passengers that they "must be prepared to travel the latter part of the journey on camels."

SHEARS AND RAZOR HEAVIER THAN THEIR MAKER

To draw attention to his store, a maker of cutlery has turned out a pair of scissors weighing 156 pounds and a razor that is almost as heavy. As in the regular articles, the razor blade can be pushed into the handle and the scissors can be opened and closed. The cutting edges have been finished off by grinding. Although they are only intended for exhibition purposes, both instruments are complete in every detail.

SIZE-FINDING DIAL HELPS ARTISTS AND PRINTERS

If a drawing is 7 inches long and 3¾ inches wide, and the artist, or advertising



Size Finder That Tells, by Turn of Handle, Correct Figures for Reductions or Enlargements

man, wants to reduce it to a two-column newspaper cut, a size-finding dial recently invented will give the correct new dimensions by merely moving a handle on the scale. Correct proportions are found almost instantly with the dial. In the old way of figuring them out, much time is required. To make it easier to read the dial, measurements from ⅛ inch to 1 inch are shown on a green curve; fractions between 1 and 10 inches are found where the red curve strikes the outer runner edges of the dial, and black diagonal lines at the edge of the big circle are read for sizes between 10 and 100 inches. There is a special edition of the finder for printers, who often need to know proportionate dimensions under an inch.

THREE DISHES FROM ONE FOR KITCHEN OVEN

One dish that serves three purposes—as a frying pan, a casserole, and a double roaster—is now being made of heavily tinned steel. A folding handle saves space in the oven. For the frying pan, the base of the new utensil is used. To make a casserole, the upper dish with cover is taken off the pan, and for a double roaster, the frying-pan base and the casserole dish are placed together, the handle being folded out of the way.

FIRE FIGHTERS IN AIRPLANE SOAR OVER FORESTS

Carrying chemicals and emergency fire-fighting apparatus, an aerial fire truck is now in use in a west-coast city. Because of the speed and wide range of action of the airplane, it has proved of service in reaching distant places and in soaring over forests to locate blazes that might develop to dangerous proportions. It may also be used along water fronts and to reach burning vessels. Only two men are in the plane—the pilot and an observer. Where a landing is possible near a fire, they use the apparatus aboard the aircraft in fighting it. If this is impossible, they carefully mark its position on maps, and report back to some point from which proper equipment can be sent. In addition, the airplane is of assistance in directing the work of fire fighters on the ground.

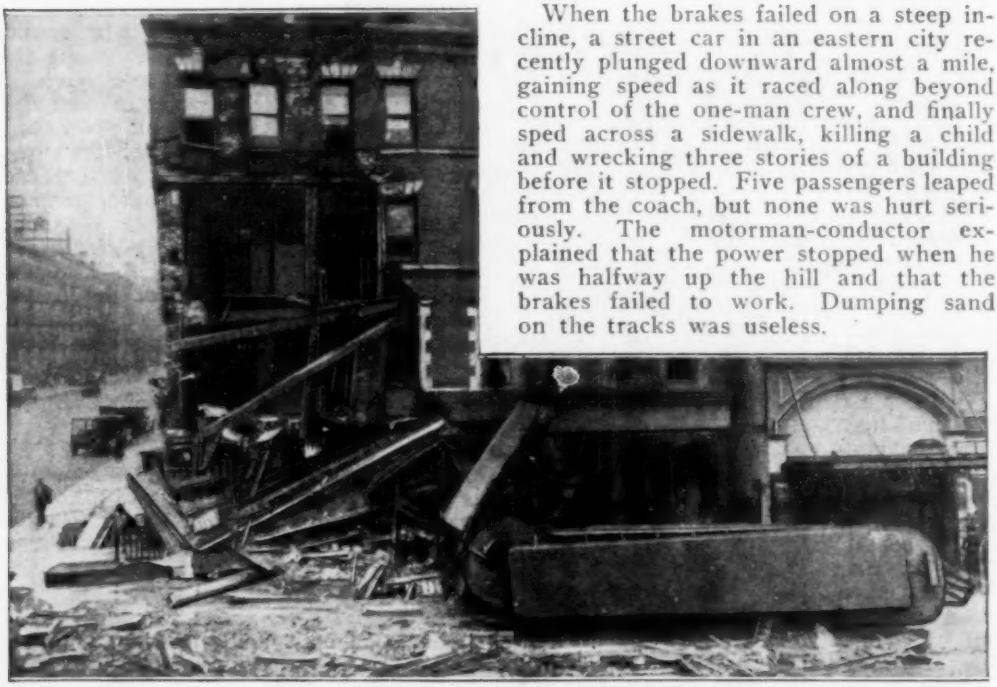
Two Aerial Firemen Ready to Answer an Alarm in Their Fast Airplane

BRUSH FOR SUEDE SHOES PICKS UP NAP

Wire bristles in a new shoe brush for which a patent has been sought, are set in a curved fiber on a canvas base attached to the wood handle at both ends. These wires are all set at an angle, making their pull stronger one way than the other. This is being found of value in cleaning suede shoes because the bristles pick up the nap better than the other type of brush does.

CAR WRECKS BIG BUILDING WHEN BRAKES FAIL

When the brakes failed on a steep incline, a street car in an eastern city recently plunged downward almost a mile, gaining speed as it raced along beyond control of the one-man crew, and finally sped across a sidewalk, killing a child and wrecking three stories of a building before it stopped. Five passengers leaped from the coach, but none was hurt seriously. The motorman-conductor explained that the power stopped when he was halfway up the hill and that the brakes failed to work. Dumping sand on the tracks was useless.

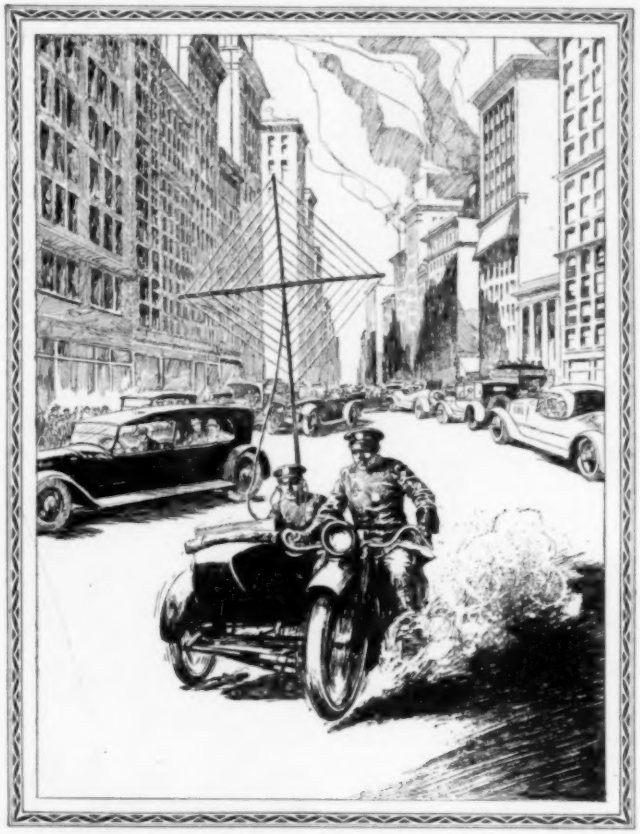


Building Wrecked by Street Car Which Plunged Almost a Mile down a Steep Incline After the Power had Failed and the Brakes Refused to Work

RADIO ON MOTORCYCLE USED TO CATCH BANDITS

Radio-equipped motorcycles have been put into service in the East to cope with automobile bandits. Aerials in the form of a loop are attached to a sidecar which also carries the receiving apparatus. Two men are detailed to each machine, one to drive and the other to act as radio operator. By the use of the radio, police headquarters are able to keep in touch with each machine and direct its movements.

It has also been found of advantage to fit up the automobiles used by law officers with wireless. Where their work requires lengthy travel, it is often necessary that they be kept advised regarding the happenings in several neighborhoods at the same time. Fire and police bureaus employ this means to report or send in alarms in cases of emergency. Where river and water-front patrols are used, the radio serves to get needed information from shore officers in the event that their aid is needed in locating the point of trouble.



Radio Outfit Mounted on Motorcycle Sidecar for Use of Police in Eastern City to Catch Criminals

TANK FOR TOY BALLOONS

Pressure tanks used to fill toy balloons with gas are so simple to operate that any boy can use them. Hydrogen is used instead of air, which gives the balloons greater buoyancy.

TIME AND BUGS ENDANGER ROOF OF WESTMINSTER

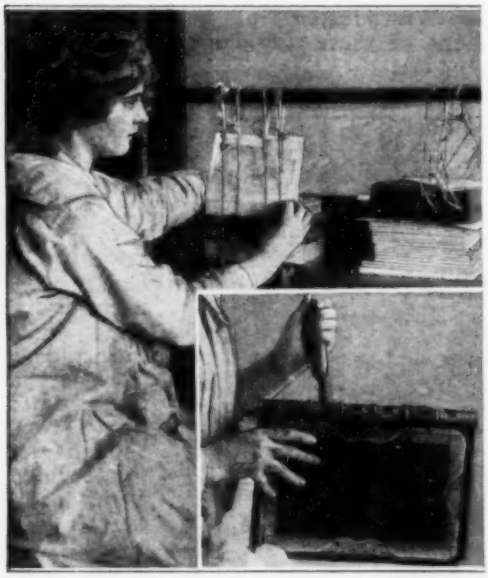
For many centuries a little wood-eating insect known as the deathwatch beetle, has been doing its best to destroy the large oak beams which hold up the roof of Westminster Hall in London. Millions of these tiny bugs were found in the inside of the timbers when they were removed recently to be replaced. Only a few of the beams were harmed. Almost all of the wood work is still in good condition, though the joints which were held by oak pins instead of iron nails have weakened from the drying of years. Steel plates, bolted to the immense beams, now serve to give them the strength necessary to hold for many more years. Tie-rods of steel have also been thrown across the high arch to keep it from sagging.

TOOL WEEDS FLOWERPOTS

A new garden tool is well adapted for work around rosebushes, small shrubs, and delicate plants. It is declared to be especially useful to florists and others in loosening the soil in the hothouse beds, and is small enough to weed a flowerpot. It has an extension handle, and, by lengthening or shortening, it may be adapted to the hand of a man or a small child.

ART OF ANCIENT MASTERS RIVALED BY WOMAN

Binding rare, old books and ancient manuscripts in covers specially made to correspond with the period of the book,



Fastening the Leaves of a Rare Volume before Placing about Them a Binding Made to Match

is the occupation of an eastern woman, who is thus preserving some of the world's most valuable manuscripts. After having determined the time when a work was done, she studies bindings of that period, and then makes a similar one. Recently she bound the "Book of Marriage," a hand-painted parchment volume done by nuns many centuries ago. So carefully was the binding made that few could detect any signs of modern craftsmanship. To properly rebuild the volumes requires intensive study of architecture, heraldry, art, and letters.

MAILMEN SLEEP IN PLANE AS RELIEF CREW WORKS

Two crews of mail sorters are to be carried in a giant airplane now being built in Europe. While one group works, the other men will sleep in comfortable beds as the ship races through space far above earth, a new giant of speed used to carry the post. It is said that this airship is to adopt every new idea of value that has been discovered in four years of commercial flying. When flying at night and in fog or cloud, an automatic device will keep it in balance. Builders say that it will travel about 2,000 miles in a nonstop flight of 24 hours. In the mail chamber, under electric light at night, sorters will go over the mail as readily as they do on trains. There will be three shifts of men to run the plane, it is proposed.

MONSTER'S TEETH ARE FOUND IN A ROCK QUARRY

Workmen in a rock quarry on the bank of the Missouri River, in Iowa, have found what is believed to be the jawbone of a huge animal that lived before the stone was deposited there. Several gigantic teeth were still in place when the fossil was picked up, but the long burial has caused the bony matter to become soft and easily crumbled.

IVORY CARVING IN ALASKA BECOMING A LOST ART

Strange shapes and figures carved in ivory tusks taken from the walrus and other animals of the northern seas, have

This Is Kugruk, One of the Last Eskimo Ivory Carvers Left in Alaska

been highly prized by art collectors. Much of this ivory work was done by the Eskimos of Alaska. During the past few years the artisans who did this carving have almost all passed away, and very few of the others have taken it up. Among the Eskimos who still make these odd carvings is Kugruk, who lives in Alaska. Though not a young man, he spends his time cutting queer-looking pictures into such tusks as he is able to get from the sea animals he kills.

MOTHER'S HEAD IS BABY CART FOR AFRICAN FAMILY

Leaving their arms free for other work, many of the native African women carry their babies about snugly tucked away in small baskets balanced on their heads. In going through the bramble-covered paths of the wild country, there is less danger of having the child scratched by the tough briers and branches which the woman pushes from her path as she passes along. In their childhood these women are trained to balance heavy loads upon their heads, and long practice gives them the ease and grace of bearing for which they are known. The men, too, are taught to

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African Mother Carrying Baby on Her Head So Hands Are Free to Defend It

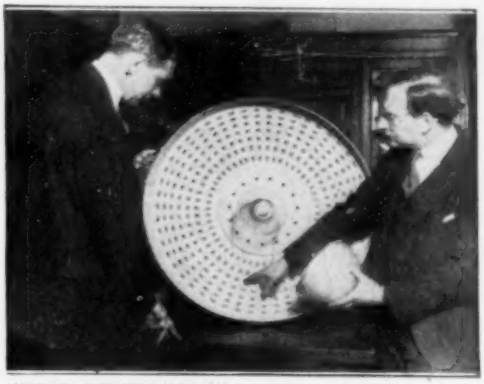
bear heavy burdens in the same way, and can transport tremendous loads for great distances without tiring.

AIR ROUTES TO TROPICS

Airplane service between a city on the southern coast and points in the tropics to promote trade and to furnish a rapid carrier for passengers, is being considered. Quick delivery of goods would result, it is pointed out, and mail planes would save several days for merchants placing orders.

KING TUT'S WEALTH SORTED IN ARTIFICIAL DAYLIGHT

To protect the treasures found in the tomb of King Tutankhamen at Luxor, Egypt, an electric-light shade has been



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Shade That will Shed Artificial Daylight over Treasures Found in Tutankhamen's Tomb

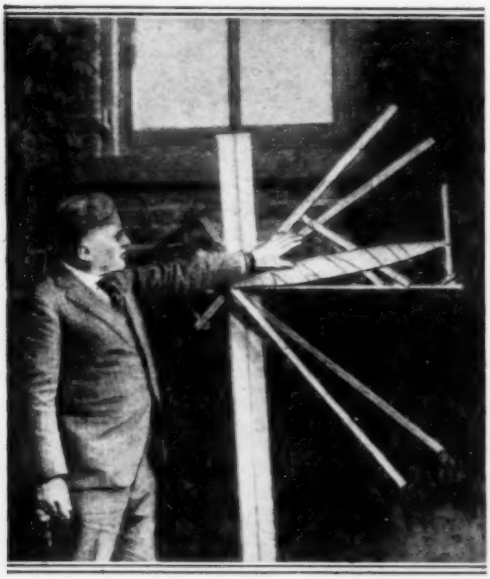
devised that will permit experts to examine fragile fabrics without exposing them to the harmful effects of open air or sunlight. The shade diffuses an artificial daylight that gives the correct color value. A series of reflectors throw the light in any direction. At present, the delicate fabrics and jewels are being examined under the light from ordinary electric bulbs, which makes it almost impossible for the examiners to distinguish the shades and colorings.

SUB AS BIG AS LAKE SHIP LAUNCHED SECRETLY

The recent launching of a submarine in England, said to be the largest in the world, was done privately, all approaches to the docks being guarded by special police. About the only fact that has been made known concerning the boat is that it displaces 3,600 tons. This is far greater than any other one known. After being launched, the giant boat, which is as large as the average lake freighter, was towed to an inclosed and guarded basin to be completed. Some of the submarines carry 12-inch guns. This one, though, is said to have even heavier pieces. It can cruise across the Atlantic ocean or move anywhere around Europe without refilling its supply of oil. On the surface it will make a speed about equal to the average ocean liner. Every improvement developed in the last 20 years has been utilized in building it.

STICKS ARE USED IN TEST OF EINSTEIN'S THEORY

Looking like a bundle of sticks of different lengths projecting from a round plate, a machine has been made in the East to test Einstein's theory of relativity. It is said that the device is the most simple experiment along this line yet made, other scientists having used costly and complicated apparatus for the same purpose, but without entire success. Several expeditions of astronomers also have visited various parts of the world to make observations, but have not been able to obtain conclusive results.



Strange-Looking Device Made to Test Einstein's Much-Discussed Theory of Relativity

SCIENCE IN HAIRDRESSING IS AN AID TO WOMEN

Almost every advancement of science has been made use of by women in their quest for beauty. This is particularly true in the care of the hair so that it may retain its softness and luster. Both electricity and gas are being used in drying machines and in permanent waving. In the olden days, hairdressing was considered an art and occupied hours of time. Today, by means of many efficient devices, it is done much more quickly, and without exhausting the patience of the subject.

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GIRLS CARRY DAISY CHAIN ON COLLEGE CAMPUS

Graduation Exercises of an Eastern College are Marked by Carrying a Daisy Chain on Shoulders of Young Women, a Custom Started 30 Years Ago

CAN MOUNT EVEREST BE ASCENDED?

BY SVEN HEDIN

[Sven Anders Hedin, noted authority on those little-known lands, Tibet, Turkestan, Mongolia, and central Asia in general, has spent a great part of his life—he is now 58 years of age—in exploring these strange lands. These journeys, performed at times amid extraordinary hardships and always at the immediate risk of lingering and terrible death at the hands of savages or by starvation, have won for him high honors and a world-wide reputation and fame. A noted scientist, a daring adventurer, a fluent writer—he is author of numerous valuable and weighty books. Doctor Hedin is an honorary or active member of nearly every scientific society in the world; is a member of the nobility of Sweden, to which he was raised in recognition of his work by the king; is the bearer of honorary degrees from most of the famous universities of the civilized world; is the personal friend of potentates and rulers, and is now on his way to Asia for another daring journey through the wild interior where he has found strange buried cities, grotesque and terrible customs, and where he has several times been forced to travel long distances on foot without water or food when his parties have met with catastrophes.—Editor's Note.]

DURING the summers of 1921 and 1922 geographical and quite especially, mountaineering circles followed with intense anxiety the reports from two British expeditions, which, equipped in the most painstaking manner, consisting of expert leaders and trained assistants, strove with admirable perseverance to conquer the highest mountain on the earth and reach its summit.

Nobody has been able to watch this splendid expedition with any greater interest than I, who have myself for several years been doing active work in Tibet. At this particular moment an armistice, of brief duration, exists concerning conquering Mt. Everest, but it is interesting to make a brief survey of the situation and forecast as to the prospects of expeditions winning their way to the top of this great mountain.

Dr. Sven Hedin

In solitary majesty Mt. Everest raises its snow-topped brow on the border between Tibet and Nepal. From the south it is difficult to get a full view of this silent giant, as it stands partly hidden from the eye by a maze of mountains, themselves covered with eternal snow and ice.

When the celebrated botanist, Sir Joseph Hooker, in 1849, made his explorations in Sikkim, it was believed that the Kanchanjanga was the highest top of the Himalayas. But thereafter, in 1852, the trigonometrical survey of India discovered a peak higher than the rest and named it "No. 15."

As this top had been identified during the time when Sir George Everest was surveyor-general of India, and after trying in vain to learn its Tibetan name, Waugh gave it the name of his predecessor, and up to this time the peak has borne the magic name of Mt. Everest.

Soon thereafter, however, the learned British resident in Nepal, Brian Hodgson, made the statement that Waugh had made an error; that the mountain had indeed a native name, Devadhunga. But later it was found that Hodgson, himself, had been mistaken about the peak. Hermann von Schlagintweit, when visiting Nepal in 1855, recognized the top which Hodgson had identified as Mt. Everest and learned from the natives that the actual Tibetan name was Gaurisankar. This native name was also introduced into geographical literature and for several years Gaurisankar and Mt. Everest were thought to designate the same top. Only in 1903 did Captain Wood succeed in proving that the two names stood for two different mountains, which are 36 English miles apart. This correction was made in 1904 on all European and American maps covering Asia. We have also learned since that the Tibetan name of Mt. Everest is Chomolungma, or "The Mother Goddess of the Mountains."

For more than 40 years the daring project of an ascent of Mt. Everest has come up again and again. Douglas Freshfield and Lord Curzon had been endeavoring to realize this aspiration, but the expedition as planned had in 1905 been made impossible by the governments of Tibet and Nepal. When I, in

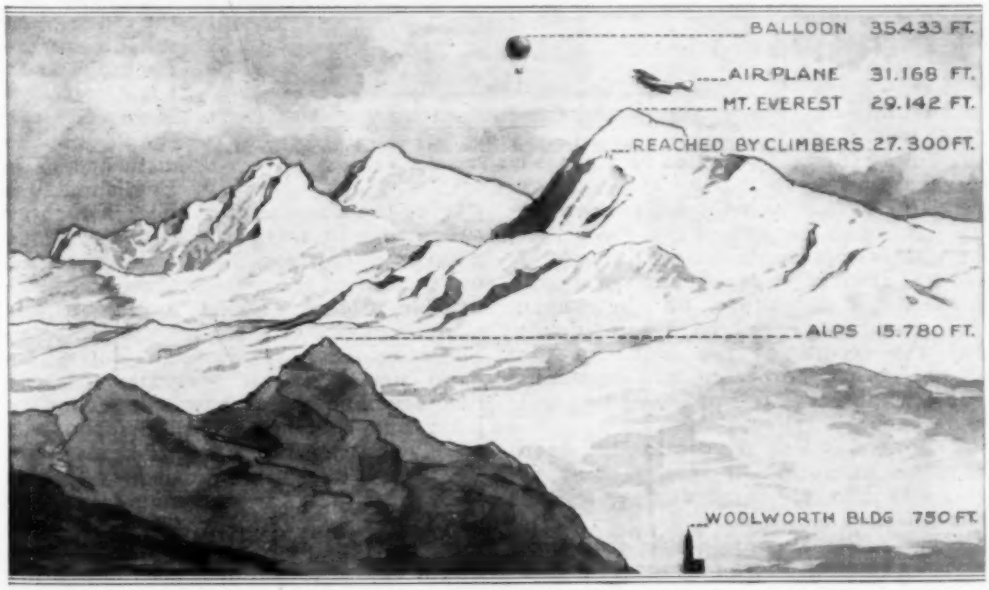
Mount Everest—the Highest Peak in the World—Towering above Neighboring Giants of the Himalayas

February, 1907, was at the Pass Ta-la in the trans-Himalaya district, 17,826 feet above the sea level, I was indeed able to see the chief chain of the Himalaya from afar.

The year before I had met Rawling in Simla. He then expressed a keen desire to try his strength on the monarch of the mountains. However, his wish, at that time and later, was coldly received by the government of India. After Rawling had fallen in the eleventh hour of the World War, Captain Noel in 1919 laid before the Royal Geographical Society a project to send out an expedition, in commemoration of Rawling, and to reach the top of Mt. Everest; but he also was unsuccessful in carrying the matter through.

A little later Colonel Howard-Bury, of the Royal Geographical Society, began to advocate the equipping of such an expedition. The heads of the society applied to the government of India. The answer was unclear, yet not absolutely refusing, and the permission of the Dalai Lama to enter Tibet was at last obtained. Moreover, there was appointed a committee consisting of three members from the Royal Geographical Society and as many more from the Alpine Club. The chairman was Sir Francis Younghusband, who was then the president of the first-named society. Lt. Col. C. K. Howard-Bury was selected as leader for the 1921 expedition. The funds necessary, which were estimated at about $48,000 for the two years together, were raised in a simple way. As leader of the mountaineering party Mr. Raeburn was chosen, who had won renown in his Kanchanjanga explorations. The remaining members were Messrs. Mallory, Bullock, and Wollaston, Majors Morshead and Wheeler, and Doctors Heron and Kellas. The last-named gentleman had in 1920 climbed the Kamet up to a height of close to 24,000 feet. He died before he reached Mt. Everest.

Younghusband laid stress on the importance of ascertaining whether human beings could live at a height of 29,000 feet; this problem had to be solved definitely. A hundred years ago it was thought that the Mont Blanc (15,780 feet) was the highest limit which might possibly be attained by man. Since that time the Andes, Caucasus, and some very high tops in the Himalayas were conquered, until finally the Duke of Abruzzi, in 1909, broke all former records by climbing Bride Peak in the Karakorum Mountains, a height of 24,606 feet. Between Pamir and Burma there are more than 70 mountain tops exceeding in height 24,000 feet, and over 1,100 tops exceeding 20,000 feet. But if these Englishmen succeeded in mounting Mt. Everest, the absolute height record which is afforded by our planet would be reached, and the essential spell of the record would be broken forever. For when once a man, risking



Unconquered Mountain Peak That has Defied All Efforts to Surmount Its Top, and How It Ranks in Altitude with Other Heights Which have been Reached by Man

his life, has succeeded in climbing the highest mountain top, all others, with whatever daring they may repeat the feat, are only anticlimaxes; the grand sensation is gone.

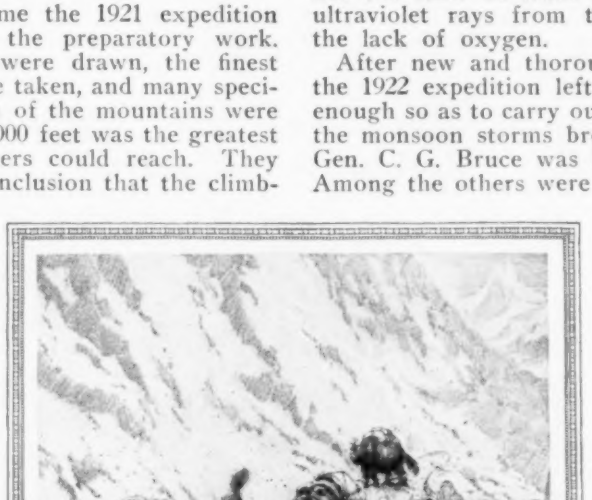
In the meantime the 1921 expedition carried through the preparatory work. Excellent maps were drawn, the finest photographs were taken, and many specimens of the flora of the mountains were collected, but 23,000 feet was the greatest height the climbers could reach. They arrived at the conclusion that the climbing would have to take place in May or early in June, before the southwest monsoon storms had broken out. It would be necessary to start from the Rongbuk Glacier at the northerly foot of the mountains and from there go up to the Chang-la or northern pass; this was to be the starting point of the climbing, properly so-called.

The report brought home by Colonel Howard-Bury in the fall of 1921, was not encouraging for those who were to try their luck the following year. He expressed himself thus: "Whether the task is capable of accomplishment, I will not attempt to say, though I should think the chances are, on the whole, against success." But he did not doubt that the record of the Duke of the Abruzzi would be beaten, and he thinks that a height of 25,000 or 26,000 feet will be reached.

Mallory was less skeptical; still, even from his utterances it is clear that he considers this climbing a very serious enterprise.

There exists a considerable difference in views between those persons who have actually attempted to climb the mountain and those who sit at home and study their maps. Younghusband believed blindly in success. The president of the Alpine Club, Prof. Norman Collie, explained the unprecedented difficulties, not the least of them arising from the ultraviolet rays from the sunlight and the lack of oxygen.

After new and thorough preparations, the 1922 expedition left for Tibet, early enough so as to carry out its work before the monsoon storms broke. Now, Brig. Gen. C. G. Bruce was leader and chief. Among the others were noticed Mallory, Finch, Somervell, and Major Norton. Unfortunately, the geologist of the preceding year, Mr. Heron, who had carried out the most significant work of all, was prevented from joining this time, so that the explorations commenced by him could not be carried to their close.



Pack Animals Used in Mountain Climbing Prefer Rough Footing on the Slopes to the Smoother Pathways

The Tibetans had expressed a desire that the "dragons which are living underneath the Holy Mountains" should not be disturbed. The Englishmen rewarded the hospitality of the Tibetans by submitting to this wish in a chivalrous manner. Thirteen Europeans thus set out for one of the most notable and inaccessible Alpine regions found on our planet, not one of them being a geologist. Sport outdistanced science. Younghusband himself, in his program, admitted that scientific research was a secondary issue, and that first of all the aim was merely to reach the top of the mountain.

The new expedition did indeed accomplish great things from a mountaineering point of view. On May 21, 1922, Mallory, Norton, and Somervell reached a height of 26,800 feet, and had thus beaten the record of the Duke of the Abruzzi by 2,200 feet. From surveys, taken the

year before, it has been decided that the first calculation of 29,002 feet is too low and that the actual height of the mountain is 29,142 feet. From the point measured by Mallory and his associates there thus remained to overcome 2,341 feet before the summit would be reached.

A week later Mr. Finch and Major Bruce reached even a height of 27,300 feet. This was to be the climax for this year, and marks at the same time the highest spot to which man has ever risen on solid ground. What is still to be climbed is only 1,841 feet; that is to say, not quite so much as the height of two Eiffel Towers. But it must be remembered that this 1,841 feet must be overcome in an air more rarefied than anywhere else on our globe. To reach the greatest height possible, Finch and Bruce had also made use of oxygen-gas cylinders.

After the return to London, some of the members of the 1922 expedition declared that Mt. Everest could undoubtedly be ascended, but that all conditions would have to be just right in order to be successful. It would take at least four days of uninterruptedly good weather and the climbers would have to be under 30 years of age. In 1922 there were only two successive days of fine weather.

As to the last stretch to the top, Captain Finch said that at a height of 27,300 feet he had a fine view of it. It is a continuous mountain crest which extends to the very top. He is convinced that it can be taken by climbing. There exists, however, one very severe obstacle: the crawling up over the steep paths is not only exceedingly fatiguing in itself, but it also calls for the irksome work of chopping out steps at a height of over 28,000 feet.

On the ground of my own experience, gained by a stay in the mountains of Persia, Pamir, and Tibet, I had, even before the British expedition started out, become quite skeptical as to its success. There does exist a height limit beyond which a man's physical condition cannot possibly endure; this limit is marked by the rarefied condition of the air. It is true that the limit is not sharply drawn, but changes with different individuals.

Thus a trained Alpinist or airman can still continue to move around in a much thinner atmosphere than one new at climbing. However, it is easier to reach a height record in a balloon than when coming to the last stretch of a mountain climb. In ascents made in the free air, heights about 11,483 feet greater have been gained than in those which took place on firm ground; this more favorable record is, of course, due to the fact that the muscular effort in climbing is enormous; in operating a flying machine, almost nothing. The flier is handicapped only by the immense speed with which he rises to great heights.

Experiences formerly undergone at dizzy heights reached in balloons did not augur well for the Mt. Everest expeditions. When Gaston Tissandier in April, 1875, made his celebrated flight, both his companions, Sivel and Croce-Spinelli, succumbed to the exertion, at a height of about 26,240 feet. They were simply suffocated through the lack of oxygen in the rarefied air; possibly their physical condition was not good enough, either.

But the leader himself, who presumably was better trained and whose power of resistance moreover was strengthened by ambition, bore the strain for 650 feet higher. And still he turned back from a point which was more than 2,000 feet lower than the peak of Mt. Everest. It is interesting to note that the record of Finch and Bruce, 27,300 feet on Mt. Everest, is about the same as Tissandier's 27,000 feet in the air. The Englishmen, however, were armed with oxygen-gas apparatus, while the Frenchman, very likely, was not.

With artificial breathing aids, it is possible now to rise a good deal higher in free-air balloons than the height gained by Tissandier. On July 31, 1901, Berson and Süring rose from Berlin to a height of 35,433 feet, which record probably has never been beaten. Notwithstanding the artificial-breathing means, both fainted long before they had reached their highest point. The self-registering instruments showed an air pressure of less than a fifth of what it was at the seaside. Berson has told me that consciousness gradually returned to him only after the balloon had dropped to where the air was thicker.

In the same way as miners and divers will reach rather quickly the limits below which no life can exist, owing to the excessive heat or water pressure, there is a height limit above which the breathing functions, with the burning process entailed by them, are no longer possible. It is clear that the layer of the earth surface, including the atmosphere, within which man can exist, will not exceed six miles in thickness. Underneath this thin layer which proportionately is not even as thick as the peel of an apple, earth hides its mysterious interior, and

beyond this layer spreads the infinite universe.

Nevertheless, however, trained Alpinists and sportsmen can, as above said, endure at the rarefied air pressure which exists on the summit of Mt. Everest. This fact has been directly proved during the preparations for the British expedition, by air-pump tests which reduced the air to a degree of thinness corresponding to a height of 29,500 feet. The men who went through the experiment even moved around and mounted and descended staircases, while carrying weights of different heaviness. Notwithstanding all this, Mallory, the most capable of all British climbers, seemed to feel skeptical about these experiments. In his opinion, experiments carried out in a laboratory with an air pump, however valuable they may be for fliers, cannot prove anything for mountain climbing, because they pay no attention to the body getting used to climates in different parts of the world, which has a very large bearing on endurance in foreign lands.

The balloonist is, during his entire trip, resting, and need not exert his heart more than usual. He can dress as warmly as he wishes and does not feel the slightest breeze, for he is always traveling at the same speed as the wind. With the mountain climber, on the contrary, muscles, lungs, and heart—in short, every part of the body—is placed under the most severe strain. Clothing must be as light as possible, so nothing that is heavy will interfere with the movements of the climber, yet it must not be so light that the wearer can freeze to death when the temperature is far below zero.

It also appears from the experience gained by the two Mt. Everest expeditions that the men who reached the greatest heights were overexerted and run down when they returned to closer layers of air. Some could no longer serve and at least one of them was compelled to travel back home. They reached their record heights in a condition of utter exhaustion; they had done everything within their power to gain the top. We must not only pronounce them as deserving the greatest gratitude of all geographers, Alpinists, and physiologists, but must also express to them our admiration for their unusual ability and courage.

The greatest of all the obstacles encountered by the mountaineer at great heights are the torments and exhaustion imposed on him by the air in motion. Not only is it rarefied and therefore severe on the lungs, but these conditions are made still worse by the violent vibrations to which the atmosphere is subjected, because nothing is there to oppose the wild play of the winds. The traveler is, therefore, almost stifled, even aside from the merely mechanical interference which the wind opposes to his movements.

Thus the decrease in physical energy keeps growing steadily the higher the expedition is continued. At every new camping place the physical tiredness is greater than it was at the preceding station, and by the time the last stop is reached the traveler, if he has not broken down before, has certainly reached the maximum of exhaustion.

It should also be remembered how severe and never-remitting the attention must be on every step where the foot is placed. It is true that this effort after a while becomes a habit; yet it engenders a drowsiness and lowers the spirit. Over all is the snow; it covers the mountain crests and fills out deep hollows, affording perilous pitfalls. Again the unevenness of the ground will necessitate circuitous walks, long and tiring beyond description, which must be taken, yet lead to the gaining of not even a foot in height, sometimes indeed meaning a loss from the height already won. Slides covered with ice will present themselves, and it may be necessary to cut steps into this ice so as to be able to continue; all this must be done while steadily exposed to the peril of avalanches which may sweep the traveler away, or of snowdrifts which may bury him. All mountain climbers must be prepared to grapple thus with hostile nature; yet the greatest height in the Alps is only 15,780 feet, so that rarefied air will not be nearly as formidable an opponent there as on Mt. Everest.

Another distressing thing is that in a rapid ascension the mountain sickness will be experienced. When, on July 11, 1890, I ascended the Demavend in Persia, I felt a nauseating pain, an agonizing headache, a buzzing in my ears at a height of 10,630 feet, but no inconvenience after I had reached the summit, which is 7,382 feet higher.

On Mustagh-ata, in eastern Pamir, I had between Aug. 6 and 7, 1894, a frightful night at a height of 20,670 feet, although I had ridden up on a yak the entire way. And the really serious work starts above this height. When the Duke of the Abruzzi on July 18, 1909, mounted

Climbers, with Oxygen Helmets to Counteract the Effect of the Rarefied Atmosphere Found above the Clouds, are Forced to Hew Steps in Icy Mountain Side with Hand Axes

Bride Peak, he was forced to turn back at a height of 24,606 feet, although the top is only 25,028 feet and he had, therefore, come within 422 feet of his goal. This small distance of 422 feet proved to be harder to take than the 24,606 feet which he had behind himself.

The drives of Amundsen and Robert Scott for the south pole were almost comfortable journeys, and Alcock's flight over the Atlantic Ocean was a pleasure trip, compared with the climbing of Mt. Everest; and yet there seems hardly anything which limits man's energy and enterprise, and his eagerness to discover something new. Still, admitting all this, I must reiterate that a limit does impose itself somewhere.

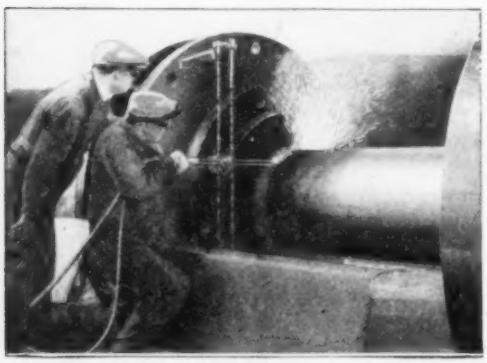
In my opinion it will not be possible to reach the summit of Mt. Everest with the means we now have at hand; but it is believable that, as new inventions are being made from year to year, as meteorology will be better and better understood and become a guide in such undertakings, as improved oxygen-gas apparatus will become available, the dream of the mountaineer may become true.

Think of the possibilities afforded by the airplane! Even now it can carry us up to a height of 31,168 feet. If we succeed in building a flying machine, a helicopter, which at a given moment can rest in the air and then slowly drop in a vertical direction, it will also be possible to unload passengers on the summit of Mt. Everest. Then, however, it would be no longer a victory of the noble sport which the Americans and British call mountaineering; it would be the triumph of aviation. From the viewpoint of a height record, it will be a trick destroying all the charm of mountain climbing.

In the meantime, however, the word stands: "Everest Unconquered!" In unapproachable majesty the hero is glancing down on the earth below, while the heavenly host of the monsoons are speeding over his brow in their whirling flight. Before the beams of the rising sun have touched any other point within view, the top of Mt. Everest is bathed in glowing gold and the evening glow is slowly dying away on its crest, while the lower peaks around the giant are already immersed in deep shadows. On silent, clear winter nights more stars are visible from that height than from any other point on earth, and they are sparkling with a sharper light, as they have to penetrate only a layer of very thin atmosphere. No other position on earth affords such an extensive horizon and no spot on the firm or flowing surface of the globe is so exposed, so solitarily grand as Mt. Everest. It is the outpost, farthest advanced, of earth toward infinite space.

FLAME CUTS THROUGH STEEL TWO INCHES A MINUTE

With the flame of an acetylene torch, a 27-inch piece of rolled steel was cut in two recently in a western railroad yard. It is said that this was one of the biggest tasks of cutting metal ever done with the acetylene torch. Only 15 minutes were required. Hooded men did the work at the rate of nearly 2 inches in a minute. A comfortable temperature enjoyed in the United States is about 70°, but this steel was subjected to a flame so hot and powerful that it melted like butter a mass of metal strong enough to support a skyscraper.

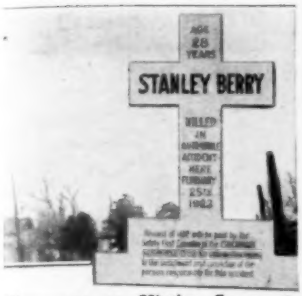


Cutting Through a 27-Inch Block of Steel with the Flame of Acetylene Torch

AIR BUFFERS GUARD PLANES FROM LANDING SHOCKS

To avoid the breaking of the underbodies of airplanes in landing, a system of pneumatic buffers has been invented in England. Although they do not change the appearance of the plane, it is said that they will prevent damage even when the machine is handled by an inexperienced pilot. In recent tests, a plane was driven full speed against the ground at an angle that would have broken the ordinary machine or turned it over. But, in this case, the buffers absorbed the shock without even bouncing.

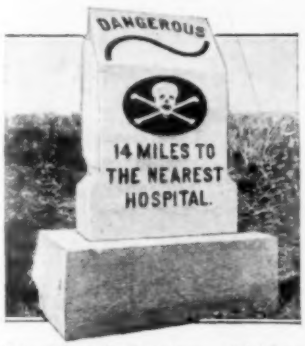
SIGNS DIRECT, AND PROTECT LIVES OF, TOURISTS



Monument to Victim Serves to Warn Speeders

Roads Marked by State with Guiding Signs

Great Cross Tells Tourist of Hidden Danger



Skull and Crossbones Help to Halt Speeders

Route Numbers Are Aid in Using Guide Book

With the great increase in automobile-tourist travel, there is scarcely a road in the world or a dangerous curve or crossing which has not been marked with signs giving either directions or a warning.

As a result, many lives have been saved and long tours made easy for motorists. Even at night, the highways have been made safe by warning lights. To eliminate the possibility of any failure of the lights, one sign has been made with a red mirror which reflects back the rays from the headlights of an approaching car.

This form of sign also is clearly visible in the day, and the face of the mirror is covered by a wire netting to protect it from the stones thrown by boys. The mesh is small enough to stop any ordinary missile, but large enough so that it will not obstruct the light rays.

Another warning sign, often used, is the twisted wreckage of some car raised on a platform. In one case a sign was attached which read: "Look Out! Three Men Died Here!" Another said: "It's Better to Be Safe than Sorry! Drive Slowly."

On an eastern road a monument was erected at what was known as "Dead Man's Curve." It carried a skull and crossbones, and the inscription: "Fourteen Miles to the Nearest Hospital." Even the most heedless motorist, it was found, slowed down when he saw this graphic warning of hidden danger.

Near Cincinnati, a great white cross has been erected as a caution against reckless driving. It carries the name of a man killed in an accident and the offer of a reward of $100 for information leading to the indictment and

Signs Used in Europe to Mark War Relics

Danger to Children Called to Drivers' Notice

Rail Crossings are Seen as Constant Menace

Many Huge Maps Give Directions to Tourists

Road and Routes are All Plainly Marked

conviction of the person responsible for the accident. At night the cross is illuminated.

Most of the signs, however, are designed only to direct the tourist, mark points of interest, and call his attention to scenic wonders. Besides merely giving directions and distance to the next city, many show great maps on billboards and point out camping sites.

Following the lead of America, most highways in Europe now are clearly marked, so that tours may be made by motorists without guides. An example of this is to be seen at Ypres, where one of the ruins carries the following inscription:

"This is holy ground. No stone of this fabric may be taken away. It is a heritage for all civilized peoples."

BABIES CHECKED IN LOCKERS BY BUSY MOTHERS

Due to the increasing civic demands made on the time of women, baby lockers have been installed in the new community hall of a California town for the convenience of mothers. Each locker is 18 inches high, 40 inches long, and 20 inches wide, with spring bottom. Doors, made of slats, are hinged downward and are provided with latches instead of locks. The hall is the social center of the community, and the installation of the nursery has enabled many parents to attend dances and social functions.

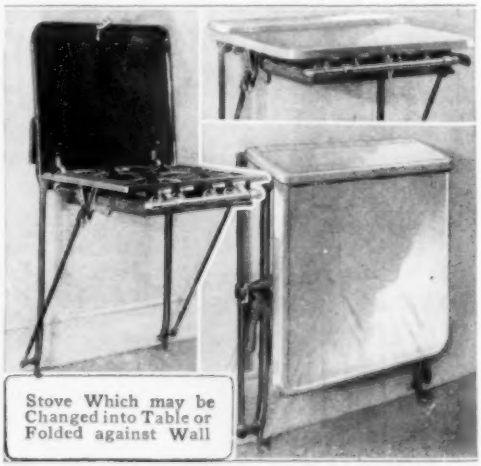
Lockers in Which Babies are Checked While Mothers are Attending Community Meetings

FREAKS OF ICE AGE CAUSE GOOD OR BAD CROPS

Ice, in some places more than a mile high, which moved over the Middle West some 50,000 years ago, is the underlying cause of the fertility of the region, according to scientists. It is explained that the glaciers cut down the hills, filled in the valleys, and ground up and mixed the rock, thus preparing the soil for the coming of man. Sections untouched by the glaciers, it is declared, are today less fertile than those which were once covered with ice. Pressure exerted by the ice was so great that huge rocks were ground into powder, making a fertile soil for the raising of rich crops and fat cattle. It is estimated that the drifts extended as far south as the Ohio River, and that after they retreated for some unknown cause, much of this region was covered by an inland sea for many years.

FOLDING STOVE AND TABLE FOR SMALL KITCHENS

Designed for apartments where the kitchen space is small, there has been invented a gas stove that can be used as a table, and which can be folded back against the wall when not in use. When the table is folded, it extends only 7 inches from the wall. The stove has four burners and the top is large enough to hold any of the standard ovens. So that there will be no danger, a cover is fitted over the gas cocks to prevent them being accidentally opened. It is claimed that the table, which has an attractive enameled top, will sustain a weight of 200 pounds. When folded against the wall, the entire device looks like a compact cabinet and gives no hint as to its purpose.



Stove Which may be Changed into Table or Folded against Wall

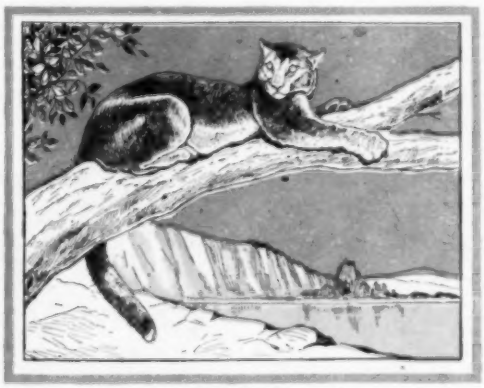
WRAPPING THE WORLD IN FURS

Part II

BY T. WINFIELD THACKERY

AMID the brilliant throng of the beauty and fashion at Deauville, France; at Biarritz; at the Paris Opera; along that great boulevard, the Champs Elyseés, a sensation had been heralded. Mademoiselle Blank, the famed actress, had appeared in a coat trimmed with a "new" fur. The milliners and modistes are besieged by eager women demanding to be sold some of the identical trimming. What was it mademoiselle wore? The query flashed up and down the avenues, in the ballrooms, at the tea tables.

Then came the answer. It was monkey fur. Immediately the feminine cry goes up, "Give us monkey fur for trimming!" Within so short a time as six weeks, American women who follow the dictates of Dame Fashion are begging for monkey hair to deck their wardrobes. Soon the demand is world-wide. What happens?



The Puma

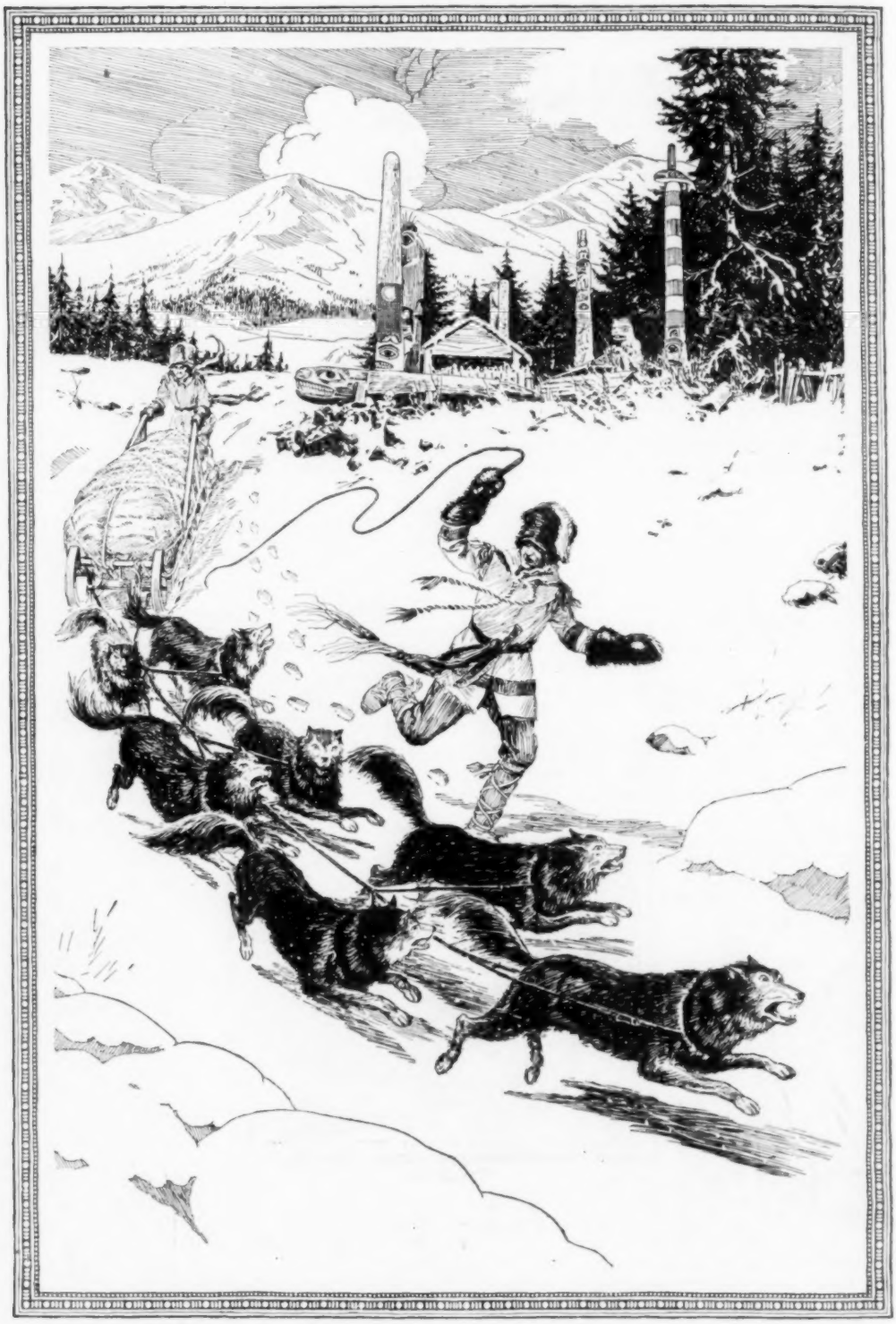
Even the caveman may have worn monkey fur. Certainly the native women and men in savage countries have worn monkey fur for ages as part of their very limited supply of covering.

Answering the plea of the women, ruled by fashion, the fur buyers and hunters go after monkeys. They buy the furs from dusky native belles, who are thereby made richer but more lightly clothed. The monkey fur rolls into the market. The prices are good—only the monkeys suffer.

Then Madame X, the noted dancer and favorite of kings, appears in a white-fox coat of novel design. The women flock to the new standard. The coat maker, the furrier, the trapper is left with thousands of dollars' worth of monkey fur on his hands and there are no buyers. Many firms go bankrupt. The only ones to benefit are the monkeys who were not killed during the fashion race.

Again, fashion does not wait on shipments. A consignment of 1,000 fox skins has been three months on the way to London from the native wilderness where the animals were caught. When it finally arrives, marten skins are in vogue. Of course, the dealers are loaded up with the wrong merchandise and suffer big losses. These are

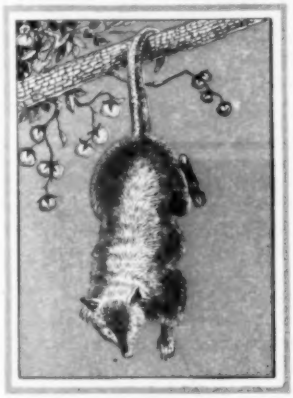
[This is the second of a series of three articles by Mr. Thackery, dealing with the absorbing subject of furs—where they come from, curious and interesting facts about the animals that bear them, and how the skins are prepared for the market. Mr. Thackery is a Chicagoan and director of the fur division of the largest retail store in the world.—Editor.]



Bringing Furs In from the Far North: An Alaska Scene, Showing in the Background the Ruins of One of Many Deserted Indian Villages Found in the Territory

some of the risks the fur industry faces.

Few realize the tremendous extent of the fur business today. It is estimated by Doctor Hornaday, of the New York Zoölogical Gardens, that 30,000,000 animals are killed every year to supply furs for the world. To bring it home, suppose every fur in your city or even in your neighborhood should suddenly become "alive" with the animal that grew it, snarling, snapping, running, leaping, fighting about the streets, in the homes, in the office buildings! The imagination hesitates to vision what the result would be. Yet all these "live" furs were "live" animals but a short time ago.



The Opossum

Just what the animal catch is each year cannot be exactly determined because of the time lost in shipments from the wildernesses, yet at two New York auctions 3,000,000 skins changed hands within 15 months. What the St. Louis market sells is also tremendous. In London, close to 4,000,000 pelts were sold in the same period, yet this did not count 18,889 house cats and other "domesticated" animals' furs sold in the period.

Where do all these furs come from? is the natural question. The answer is "From all over the world." From a district surrounding St. Louis for several hundred miles comes a great supply. From practically every state in the Union the trappers, professional and occasional, send in bales of furs every season. In each case the furs coming from the northern tier of the state are ranked the best. This is because the colder the climate the heavier and thicker the fur must be to protect the animal that wears it. The heavier and thicker and better-quality furs thus originate in the north of each state, and consequently in the north of the country as a whole.

The Muskrat

For instance, great quantities of muskrat may be caught in Louisiana, but the weather is so generally hot there that the animal does not have to grow very heavy fur to keep it warm. Therefore, the muskrats caught in the northern part of the United States and in Canada are more sought after and bring better prices.

Then the natural habits of the animals themselves have something to do with the supply. As an instance, rabbits have a tendency to multiply too rapidly every few years. This develops a skin disease among the little animals which so tortures them that they come out into the open, seeking relief, and become an easy prey to lynxes, wolves, foxes, and other animals that prey upon them.

This abundance of tainted food gives disease to the lynxes, foxes, and others, which results in a high death rate among them. The killing of the infected rabbits and the death of their captors mean only one thing — a serious shortage, amounting almost to a disappearance of these fur-bearers the succeeding season. Thus Nature, herself, serves to keep a balance in the fur market. However, the supply is bountiful if man, in his greed, does not violate game laws and engage in ruthless killings. When we speak of having a mild or open winter in certain sections, the raw pelts will reflect that condition, and fur ex-

The Lynx

perts, on examining the skins, can not only analyze the severity of the winter season, but name the district where the animal was trapped and the month of the year in which it was caught.

This seems marvelous at first glance, but it is, after all, not to be wondered at. Men who have been in the business many years—and to be a judge of raw furs one must have spent a long time in training—remember the character of the past winters. If they know the winter of five years ago was exceptionally warm, they know the furs caught that year will be light. Then, too, as we approach the poles, the character or color of the animals blends in with the scenery and is white, and as we approach the equator the tendency is reversed, and likewise their thickness of fur will be regulated by their range and the seasons of the year.

This brings us to the third factor in the fur industry, the first two being fashion and natural supply. The fur catch of the north, trapped in midwinter, must find its way to the world markets by travel on foot, dog train, rail, and boat, and consequently, many months, and in some cases a year, will elapse before collections from the far-north country are received and sold at auction in the metropolitan markets of the world. Furs in the early days were as valuable as money, and profits from the sale of furs reasonably assured, but of late years the fact of the long lapse of time being required to deliver pelts from the source to destination, makes the undertaking a most speculative venture.

Man, in seeking out furs, has gone to great lengths, and by so doing has advanced the prices of many common furs to the point where hunters and trappers stepped in and are likely to almost exterminate some kinds. Thus the muskrat, once considered as of no value on the market, now is a big factor. Peak prices in 1913 for muskrat skins were $1 each—in our fathers' day it was 25 cents. In 1920 muskrat skins brought $6.80 on the open market. In the United States there are more muskrats than any other fur-bearing animal. This is the pelt which is used for the so-called Hudson-seal coats. So, too, has the skunk come into his own. His skin is sometimes known as the "civet cat." Twenty-five years ago he was safe. Today everybody wears his skin.

Occasionally, furs with names that were not on the passenger list of the Ark make their appearance. For instance, "nutria" began life as the hide of the coypu rat. Red or Siberian sable becomes "kolinsky," and although the European polecat may be that in life, he passes into furland as "fitch." The curious little Australian "bear," or koala, becomes the "wombat," and the striped skunk emerges a whit more attractive as a "civet cat." The domestic cat is completely concealed as "genet." Now and then some unscrupulous dealer takes a rabbit skin, worth 25 cents, dyes it rather well, and lo! it is "real" chinchilla, worth $10 a pelt.

Among the more expensive furs we list the silver fox, the chinchilla, the ermine, beaver, Alaska seal, mink, the sea otter, and a few others of western-hemisphere stock. Tiger, leopard, Persian lamb, kolinsky, gray squirrel, and the like are from the Far East and Africa, and are also quite expensive. Rugs of tiger and polar bear used to be the fashion, but nowadays they are a drug on the market.

Silver-fox skins bring from $500 up per skin at retail. Chinchilla coats sell as high as $32,000. Alaska sealskin coats with, say, collar and cuffs of Hudson Bay sable, bring $2,000 and up, for it takes six sealskins usually to make a coat.

The wearing qualities of these furs are

Many Thousand Dollars' Worth of Silver, Blue, and White Fox Skins Sold Yearly at St. Louis Auctions

not generally known. In this connection the natural otter skin used for men's collars is the best, and is rated 100 per cent in comparing this feature in all other furs of the world. Chinchilla, the delicate and beautiful little animal from the South American high altitudes, which is used to trim elaborate coats for evening wraps, ranks, mole excepted, the lowest in wearing qualities.

If it is asked how these animals are caught, the answer is, again, a difficult one to make. Men all over the world make a profession of catching animals in traps, pits, by shooting, and by poison bait. In the United States the trappers are in the majority. Sometimes they provide their own traps, sometimes the fur-buying company or the United States Government gives, or loans, or sells them traps. The government is the largest trapper, but confines its efforts to catching animals, like lynxes or wolves, which destroy more game and property than they are worth as natural inhabitants of the land. The government sells all its furs through one company, whose operations will be discussed in the last article of this series. Habits of the animals also present a problem for hunters. As many know, the otter, aside from being "the playfulest critter on earth," is a great wanderer. He frequently travels as far as 15 miles in a night, is very clever in foiling traps, and is hard to catch. Foxes, due to many years of wariness, are likewise difficult to approach. Naturalists tell us that the apparently playful romping of young foxes, while their mother looks on and guards them, is really a device of nature to train the cubs in the art of self-protection. This time of cubhood is the only one in which the animal can safely experiment in self-defense, train itself in hunting, and learn the thousand and one other tricks by which it often saves its life in later years. For the mother is watching, and failure to do a trick or fight well in cub battles then, does not mean loss of life as it would later.

The Beaver

Beavers are becoming quite scarce in these days and their skins correspondingly more valuable. The great skill of the animal as a builder is well known, his habit of only partly gnawing through the butt of a big tree and then waiting for the winds to blow down his "log" leading scientists to believe that he also possesses some reasoning power.

The mole, whose skin is so prized, is among the queerest of animals. Its ears have no "trumpets" or projecting parts, for they would be in the way when it digs through the earth. Its eyes are not of much use, so they are tiny, being but one-twenty-fifth of an inch in diameter. Its hair has not "set," that is it does not get disordered when it moves backward in its burrow, and so is easily kept clean. Further, it can dig through hard or soft ground with a swimming motion of its paws, or it can simply push its way through soft earth near the crust, or it can run on the surface at about 2½ miles an hour, or it can trot along a burrow large enough. It can eat its weight in worms every day.

The Skunk

Though settlement of the country is fast curtailing the wildernesses which are the natural haunts of the valuable fur-bearers, trapping is still a very profitable pursuit and will continue so for many years to come. All accounts from the Canadian northland are to the effect that furs are pouring into the trading posts at a very heavy rate, and this season's catch bids fair to eclipse the very satisfactory one of last year. The pelts are of excellent and exceptional quality, and with a continuance of the profitable prices which prevailed at the fall sales, the total of peltry will be valuable.

MACHINE READS CHARACTER OF PERSON USING IT

By watching hands and feet and the face, a professor in a middle-western university reads the character of persons sitting at an apparatus he devised to classify students. Seated at a bench, the subject is required to work a series of pedals and levers in response to signals. The idea is to act quickly. It is a test against time. The student who becomes nervous might not be a steady hand at the wheel of an automobile or as a motorman or engineer, the inventor thinks. When a person goes to the machine and sits down quickly, studies it out, and then works it right and fast, and smiles and is eager, the inventor believes such a man or woman is aggressive and is to be trusted. Some come to the machine feeling that it is silly. They perhaps make mistakes. They do not act quickly. They frown. They grit their teeth. They give up soon. Such persons, the professor says, are easily discouraged.

Professor Watching a Student as He Pushes Pedals and Pulls Levers of a Character-Reading Machine

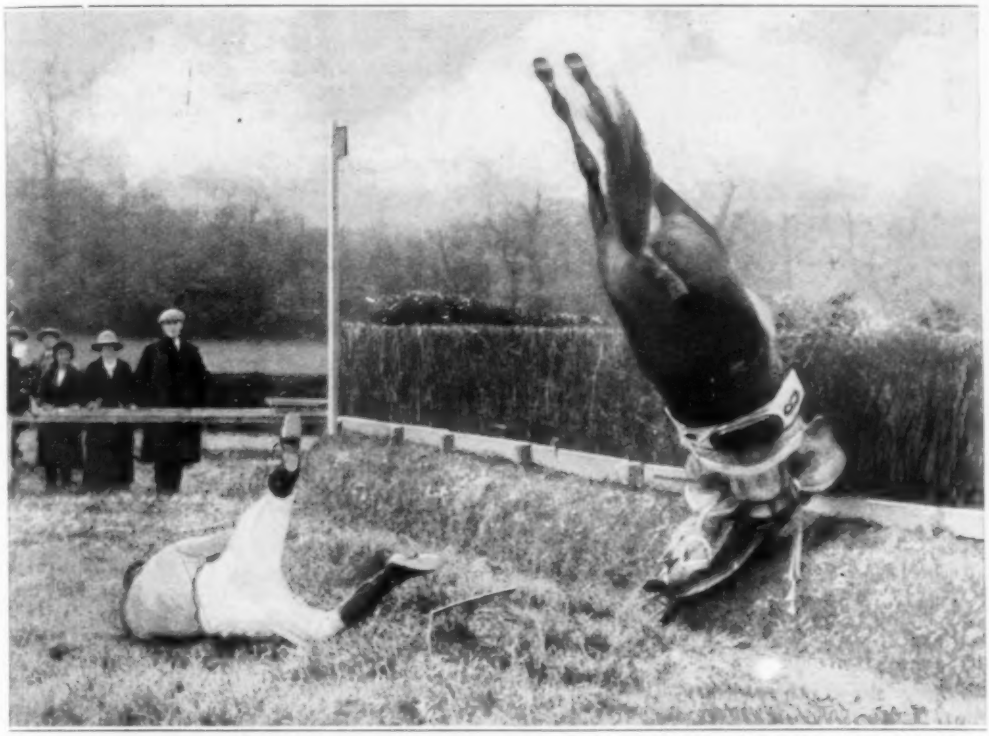
SPIRAL BRIDGE MAKES QUEER ENTRY INTO TOWN

Spanning the Mississippi River at Hastings, Minn., is a bridge so high above water that the approach into town had to be built in the form of a spiral. It is a highway bridge, and was built on high towers so that ships could pass under it. The business section of town is at a much lower level, and a queer-looking entry was decided upon to provide an easy grade from the bridge floor.

This Odd-Looking Bridge Is on the West Bank of the Mississippi River, at Hastings, Minnesota. It was Built on a Spiral in Order to "Ease" the Grade from the High Bridge Level in the Background

EYE OF CAMERA RECORDS RACE ACCIDENT

When the leading horse in a hunters' chase in England, tripped at the last barrier, a photographer was on hand and



Rider Crashing to Earth as the Result of a Dramatic Accident, Which Took Place at a Hunters' Chase at Lingfield, England: Neither the Horse nor the Rider was Injured

snapped the most sensational spill of the meeting. The photograph was remarkable because it caught both horse and rider as they pitched headlong into the turf.

FEVER IN STORES OF GRAIN TOLD BY ELECTRICITY

Every year great quantities of stored grain are lost through fire caused by the action of the air on the living cells. To eliminate this danger, a device has been made in Europe which records the temperature and gives warning before it begins to burn. It has been found that corn left in elevators lives and breathes. It takes up oxygen from the air, which combines with the starch in the grain to form an acid. As the process continues, it results in fever and heat. Under the new plan, thermometers placed in the grain record its temperature on an electric drum at some central point.

BIRTHDAY OF ELECTRIC CAR FORTY YEARS AGO

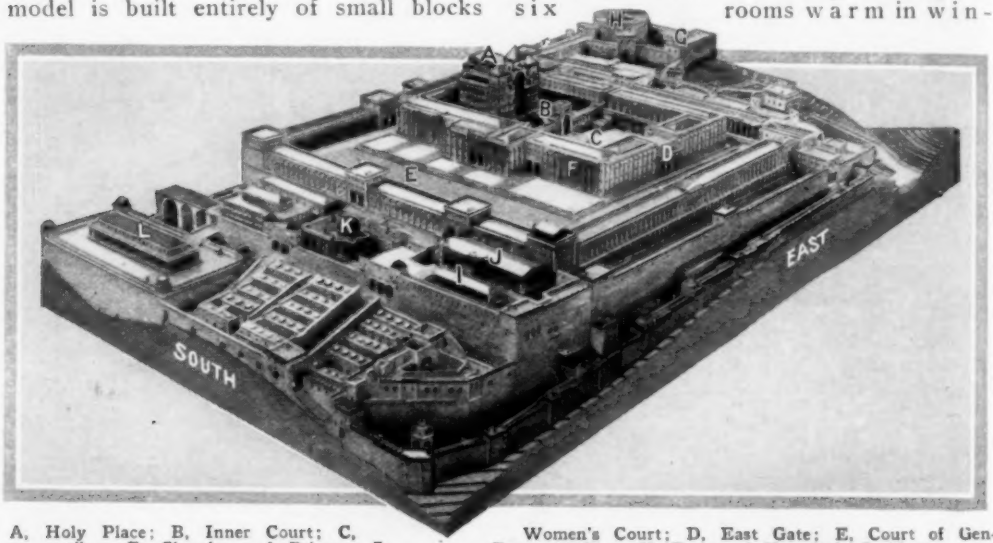
What is declared to be the fortieth anniversary of the first hydroelectric railway in the world is being celebrated in England. It was opened in 1883 and the length of the line was only eight miles. Electricity was generated by a waterfall and was conducted to open cars by a third rail. Later this was replaced by an overhead trolley. Repeated failures, constant breakdowns, and other great obstacles were overcome before the system became a success. In celebrating the anniversary, a replica of the original car, filled with a notable assemblage of engineers, made a trip over the same line.

MIRRORS USED AS SCARECROWS

Swinging mirrors hung in fruit trees have proved of value in frightening away birds. Fastened by a string, they move in the breeze, and the light of the sun is flashed here and there through the branches. If mirrors cannot be obtained, pieces of polished tin will answer the same purpose.

TEMPLE MODEL SHOWS SKILL OF ANCIENT BUILDERS

Thirty years of research and study and six years' toil were necessary to construct what is said to be the first accurate model of the famous Temple of Solomon, built in about the year 1,000 B. C. The reproduction is the work of Dr. Baurut Schick, who has spent most of his life excavating in the ruins about Jerusalem, and it is now being shown in the principal cities of this country. The model is built entirely of small blocks and strips of wood, and is declared to be the best example yet shown of the architectural skill of builders who lived in Palestine 10 centuries before the Christian Era.



A, Holy Place; B, Inner Court; C, Women's Court; D, East Gate; E, Court of Gentiles; F, Chambers of Priests; G, Tower of Mea; H, Tower of Hananeel; I, House of Pharaoh's Daughter; J, Royal Palace; K, Throne of Judgment; L, Millo

MOVABLE ASH TRAY CLAMPS ON ARM OF CHAIR

Adjustable to any angle so that it is always in convenient reach and yet never in the way, an ash tray has been invented which fits on chair arm, table edge, telephone, or stands alone. For use in both office and home, it is claimed that it will not spill ashes, as it cannot be upset while in use. As it is suspended from the edge, it leaves the chair arm or top of a desk or table clear. The bowl is attractively finished in several colors.

¶ Erection of a giant pipe organ, one of the largest in the world, is being planned for the so-called cathedral rocks in Zion National Park in southwestern Utah.

THERMOS HOUSE SAVES FUEL AND HELPS KEEP COOL

Built like a thermos bottle, with cavities in the walls, a system of building construction has been patented by a western inventor which, he claims, will save 50 per cent of the heating cost as well as help to keep the home cool in summer. In a bungalow built on this plan there were double walls with a vacuum space between. Although it had no furnace, it was found easy to keep its six rooms warm in winter. In the summer, blankets were used in sleeping, although the outside temperature was 80 and 90 degrees. Also, a very even temperature was registered within the house throughout the changing seasons. The double walls, in addition, proved to be almost sound-proof. The cost of the building was said to be less than in other houses of the same size, and the time required for construction less. Fireproof shingles were used and the outside finished in stucco.

WRITING DESK CAN BE MADE INTO TABLE AS WELL

By a simple pull forward on the folding leaves of a new combination writing desk, it can be turned into a solid, substantial table. As well as having the feature of being two pieces of furniture in one, the desk is easily folded up and can be stored in a small space. It is designed particularly for the occupant of the small apartment.

MOTORCYCLES IN RACE ABROAD TO SHOW ECONOMY

Because of the high cost of gasoline abroad, motorcycles with sidecars are being designed in Italy to compete with the automobile, which uses so much more fuel to travel an equal distance that thus far its use has been confined to the wealthy. In Italy, motorcycle races are being staged to show the economy, speed, and comfort of this form of transportation.

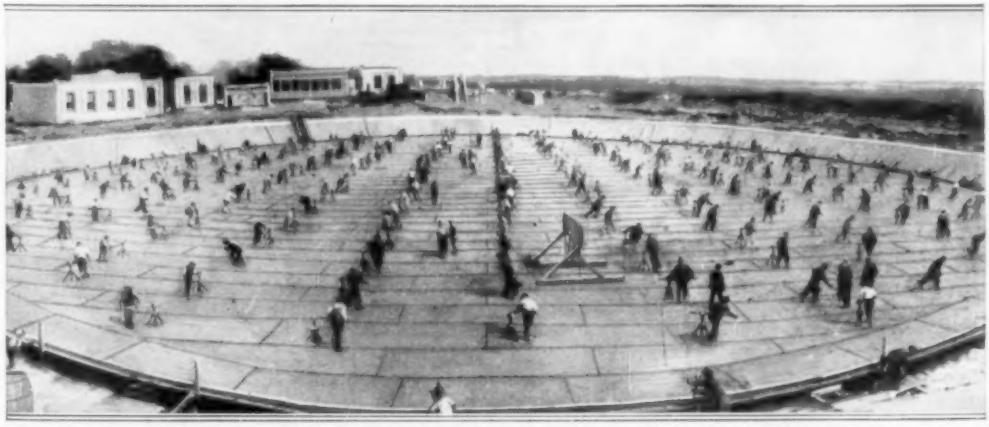
Motorcycles with Sidecar Racing in Europe

EXPLOSIONS TO AID EARTHQUAKE STUDY

Surplus explosives of the government, left over from the war, may be used as aids in the study of earthquakes. The idea is to cause miniature earthquakes, and take observations of the rate of vibration through different layers of the earth's crust. In the case of natural earthquakes, accurate measurement is obviously not possible.

MOVING GIGANTIC GAS TANK WITH HAND JACKS

Three hundred men, each at the handle of a hand jack, recently moved a huge gas-tank base, weighing 250 tons. The base was lowered in 40 minutes by the small army of men, who were placed with their jacks on every other big steel plate on the top and rim of the tank. Round and round the jacks they went like horses in a treadmill, moving together when ordered by the foremen in the center. By their feat in a western city these men, who moved with small hand jacks a tank holding 10,000,000 cubic feet, have applied Archimedes' principle of "Give me a place whereon to stand and I will move the earth."



Lowering the Base of a Gas Tank in a Western City with 300 Men Using Small Hand Jacks: Forty Minutes were Required to Move This Tank, the Base Weight of Which Was 250 Tons

MOVABLE AIRDROME RAISED HIGH ABOVE EARTH TO ASSURE SAFETY OF AVIATORS

Hazards of Landing on the Ground would be Eliminated by Proposed New Platform on Top of Tower, So That It could be Turned with the Wind to Allow Aviator Best Position in Starting and Descending

TURNTABLE AIRPLANE LANDING HAS 500-FOOT RUNWAY

Keeping pace with the rapid progress made recently in the development of airways, a landing stage has been designed that automatically heads into the wind and possesses other unique and practical features. This airplane landing can be set to remain stable in all light breezes, and then switch itself into automatic control at any predetermined wind speed. This feature is highly important, for the aviator must head into the wind to make a safe landing. Many risks are thus entirely eliminated when a pilot has the wind to land against at all times.

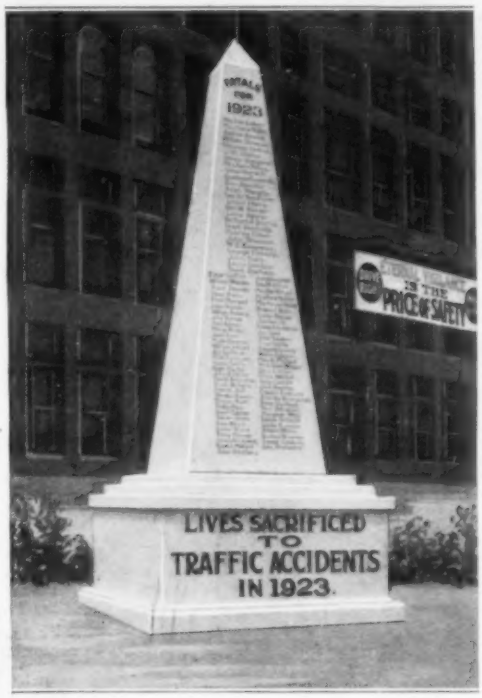
Another advantage lies in the fact that the plane is able to "hop off" into the wind from a standing start, at any required speed, according to wind conditions. The plane is restrained in stays in the starting room, its engines speeded up to the desired point, and then automatically released. As it rushes into the air its propellers lose no power, as they are turning at a speed which corresponds to the required starting speed of the plane. This condition is not always present when taking off from the ground.

"Streamlining" the body has been resorted to wherever possible, in order to keep the wind resistance low. In this respect the "take-off" portion of the airway resembles a huge whale. Considerable ingenuity has also been displayed in the development of the operating mechanism. The receiving controls for the landing of planes actuate a moving platform, so that an airplane will land, not with a shock, but with a gliding motion. Landing platforms are about 500 feet in over-all length, and from 60 to 80 feet wide. These dimensions, as well as the height from the ground, are variable for different localities and conditions. In cold regions a series of brushes will be provided to scrape the snow from the platform as it moves under them.

It would seem that this type of landing could be put to a variety of uses. A series of them along an exposed border would provide adequate and constant inspection service, and this application could also be made in coast-guard work. Equipped with radio, each would be in easy communication with any other, or with headquarters. The landings are also in position to serve as a refuge for airplanes in case of storm. Elevators inside the tower will convey passengers to and from the level to the platform.

DEATH SHAFT IS WARNING TO CARELESS DRIVERS

Names of all who were killed by autos in a middle-western city during the first four months of this year are shown on a

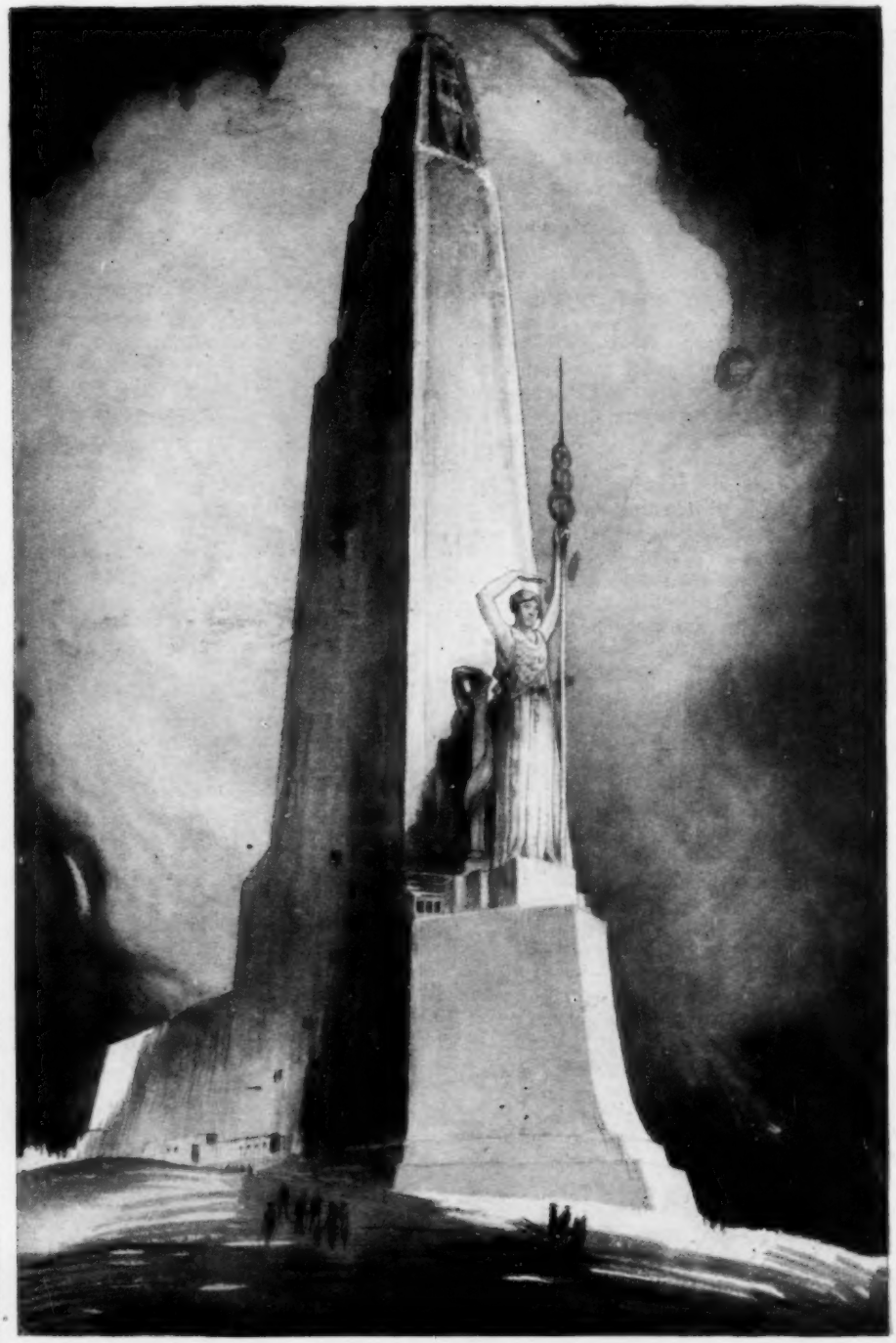


Shaft Bearing Names of Those Killed by Autos, Erected as a Warning to Speeders

tall white shaft in front of the city hall where thousands of motorists see them daily and are thus reminded of the need for more care in driving. During one week of the drive every auto on the streets of the city was stopped for two minutes each noon and bugler policemen sounded taps for those who had died in auto accidents.

RUGS MADE OF RUBBER AID IN CLEANING FLOORS

Rubber rugs are now being made. They look like rag rugs and are being used widely because they do not collect dust, can be washed without moving from the floor, can be mopped often without danger of losing their bright colors, and because they will not slide, even on slippery tile floors. The corners never curl up, and dust does not sift through to the floor. They are being made in many colors.



Colossal Monument to Express French Gratitude to America, Now being Built at the Mouth of the Gironde, Where First Troops from the United States Landed

FRENCH GRATITUDE TO U. S. SHOWN IN MONUMENT

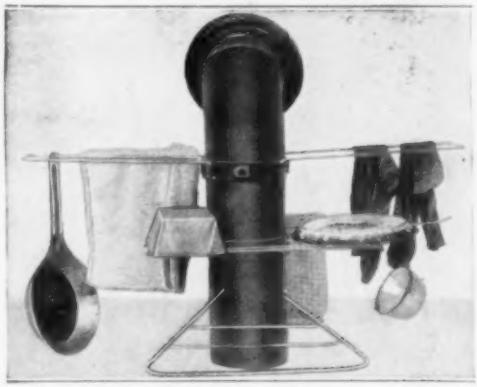
Rising 325 feet above the earth, a colossal statue of France, scanning the horizon for the American ships, is being built on the cliffs at the Pointe de Grave, on the Gironde, where the first soldiers from the United States landed during the war. As an expression of France's gratitude, the foundation stone of the colossal monument was laid in 1919, on the anniversary both of the first battle of the Marne and of the birth of LaFayette. The general design, which has been altered considerably since its first conception, has been prepared by M. Bartholome and M. Andre Ventre, the latter the architect of the famous "Trench of Bayonets." A bas-relief at the base of the shaft will represent the arrival of LaFayette in the United States in 1777.

NONSCUFF HEEL GUARDS SAVE SHOES IN CAR

As an aid to women who drive their own automobiles, a guard has been made of heavy leather to fit over the heels of high-heeled shoes by means of an adjustable strap. It has been designed to keep the heel from rubbing the floorboards of the car when the brake and clutch pedals are used. The guards are not unsightly and are easily attached.

KITCHEN STOVEPIPE USED AS WARMING SHELF

How to make a stovepipe more useful has been solved by an eastern inventor who has devised a metal band to fit

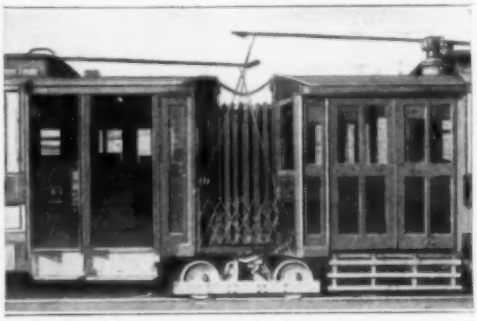


Clothes, Pans, and Dishes being Dried and Warmed on Rack Fitted to Stovepipe

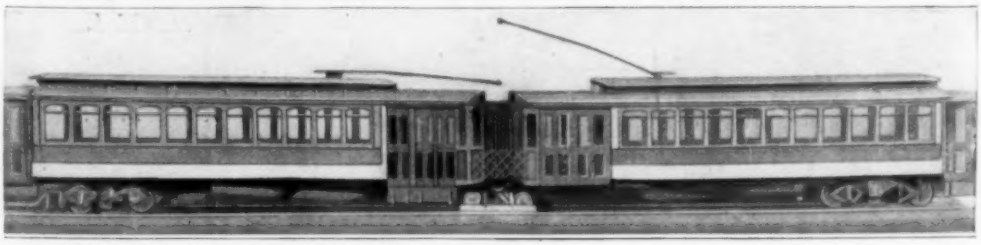
around the pipe. Wire holders are mounted on a ring fastened to the pipe. From these may be hung utensils, fabrics, or articles of clothing which are to be dried. Several bands may be fitted to the same pipe to act as plate warmers or merely as shelves. They are within convenient reach of the busy cook, and may serve to hold food removed from the stove.

TWO-COACH STREET CARS RUN ON THREE TRUCKS

When a number of old street cars became too costly to operate, the management of one western traction company increased their usefulness by lengthening their frames and joining them up in pairs. This resulted in a two-car train, having only three trucks. Two men operate the train where formerly it required four to run the two cars separately. The results of this arrangement have proved so satisfactory that the plan has been patented.

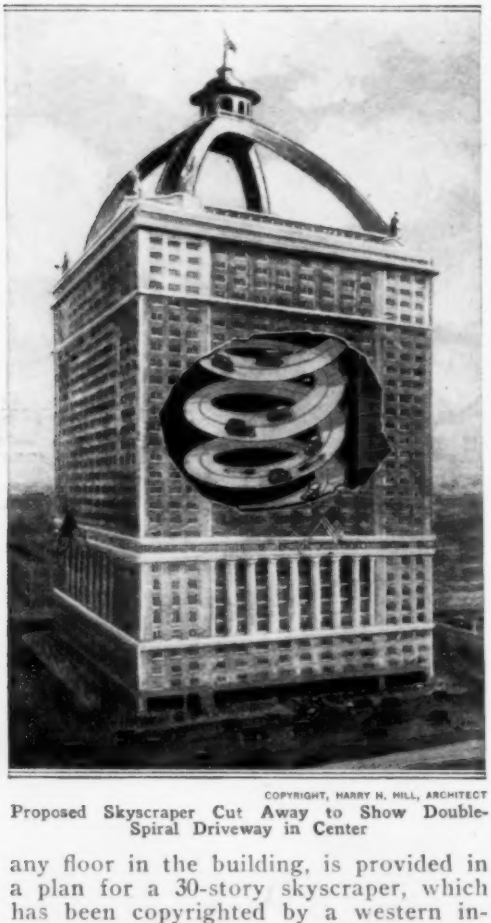


Below, Two-Car, Three-Truck Train, and Above, a Close-Up of the Coupling



PARKING SPACE FOR AUTOS IN SKYSCRAPER PLAN

Parking space for autos, with a reverse, double-spiral driveway that would permit motorists to drive their cars to



COPYRIGHT, HARRY H. HILL, ARCHITECT

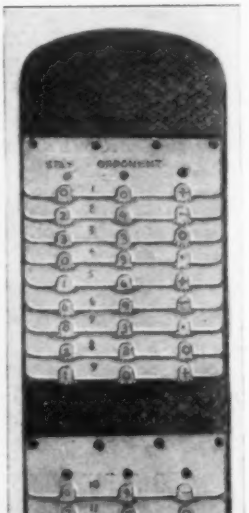
Proposed Skyscraper Cut Away to Show Double-Spiral Driveway in Center

any floor in the building, is provided in a plan for a 30-story skyscraper, which has been copyrighted by a western inventor. Tenants of the 3,000 offices in the building could leave their automobiles just outside their respective places of employment without fear of them being stolen. Another advantage, it is claimed, is the saving of time that is now spent in looking for a place to park. A driver, too, could leave his own garage in bad weather and remain in the car until he reached the door of his office.

The automobile drive to the 30 floors would be placed in the center of the building, circling with a gradual incline up to the roof, where an open-air auditorium, capable of seating 8,000 people, would be built. The roof area could also be used as a landing place for airplanes and dirigibles. A steel observation station, resting on four supports, one at each corner of the building, is also included in the plans. At night the tower would be lighted and would house a large searchlight, to signal aircraft, and a radio broadcasting and receiving set.

From the street entrances to the top of the building, the driveway would be about two miles long, with an average grade of 3 per cent. In the center of the structure a sound chamber would be provided to eliminate noise and gases. Two cars abreast could drive up or down the spiral roadway. The entire building, it is estimated, would cost about $15,000,000, but the driveway could be also adapted to hotels and large apartment buildings.

POCKET GOLF SCORER KEEPS TAB ON TWO PLAYERS

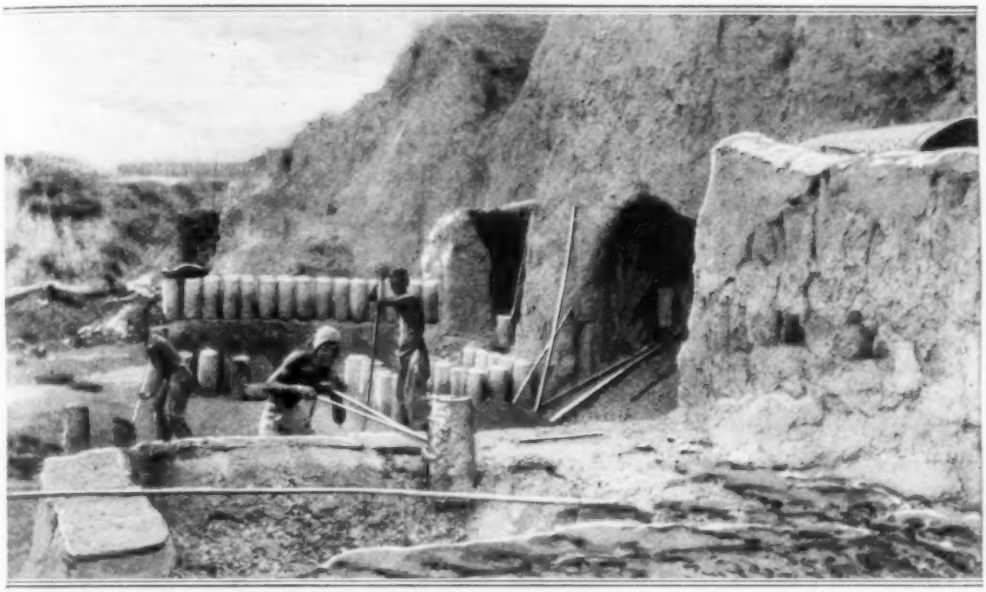


All nineteenth-hole arguments over golf scores should be eliminated by a pocket scorer recently patented. Built like a purse, it is easily carried, and enables a player to keep his own score and that of his opponent. The number of strokes and holes is recorded on movable disks and numbered strips of celluloid. The proper use of the device eliminates many disputes caused by faulty memory on the part of the players, and serves as a constant check during the progress of the game on both of the contestants.

IRON SPRAYED WITH ZINC

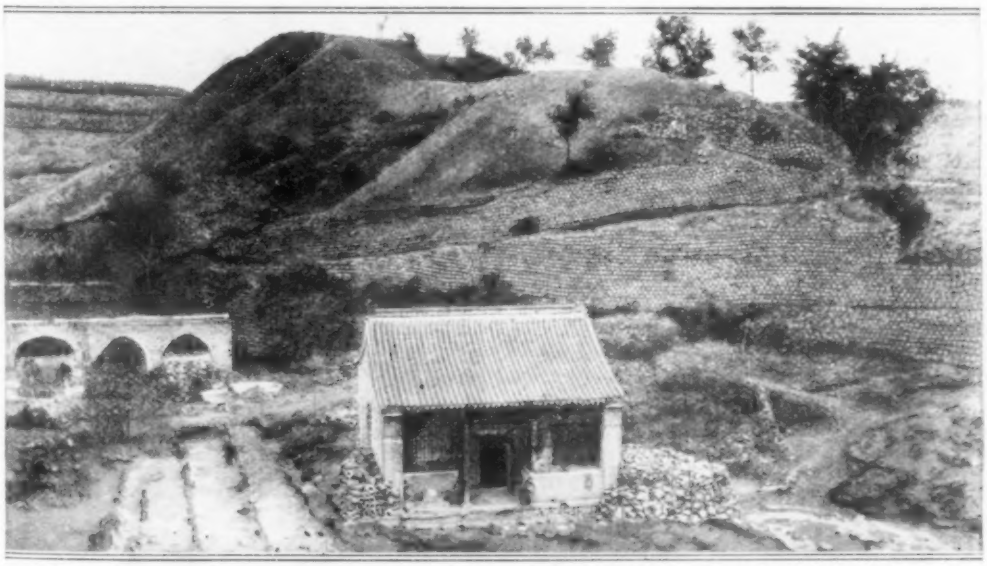
As a covering for iron and steel to prevent rust, melted zinc is being coated on these metals in Europe. While at great heat and in a fluid state, the zinc is sprayed directly on the iron or steel. This is an inexpensive way to protect bars and rails from the injury done by air if they are not covered.

AGE-OLD WAYS OF MAKING IRON USED IN CHINA



How Natives in China, Using Only the Most Primitive Methods of Iron Making, Remove the Jars Containing the Metal from Crude Furnaces

What progress science has made in the making of iron or steel may be realized from the primitive methods still in daily use in China. Beginning at the mines, the only hoisting engine is a cheerful coolie, and the shafts are shallow. The ore is reported as being of rather poor quality and it exists only in small deposits, usually no more than 3 feet thick. After being brought to the surface, it is hand-sorted, mixed with coal and then smelted in crude furnaces. It is three days before this part of the task is finished. Labor is so cheap



An Impressive Example of the Extent to Which the Small Jars Used in Making Iron have Accumulated through Years of Turning Out the Metal in China

and economy is so necessary that the jars which have been used are repaired and made to serve again. Some of the

Cheerful Coolies Are the Only Hoisting Engines Used in Mining Coal in China

Jars Used in Making Iron in China are Made to Serve a Second Time to Reduce Cost

coal becomes coke, and this is mixed with clay to make new jars.

SMALL SPRAY TURNS TUB INTO SHOWER BATH

So small that it may be carried in the pocket and attached to any water faucet, a socket has been invented to turn an ordinary tub into a shower, or needle-spray bath without the use of a cabinet or rubber curtains. As the nozzle turns in a rubber socket, it can be adjusted to any height desired so the water will not wet the hair. It is declared to be of special value to tourists, traveling men, and those whose homes are not equipped with stationary showers.

GREAT SHIP STEERS ITSELF WITH A "GYRO-PILOT"

Navigated automatically and steered by a "gyro-compass" and "gyro-pilot," the steamer "Harry Luckenbach," a large freighter, has been used in a series of tests on the west coast. After the course has been set, the mechanical helmsman holds the vessel to it for periods of half an hour or more. Attached to the steam steering apparatus, the device is worked on the principle of the gyroscope. If the ship deviates from the course set, it will work the rudder to bring it back. As it serves as a constant check on the watchfulness of the pilot, it is claimed that the device will eliminate some of the dangers of navigation.

KNOTS TIED BY MACHINE STRAPPED TO HAND

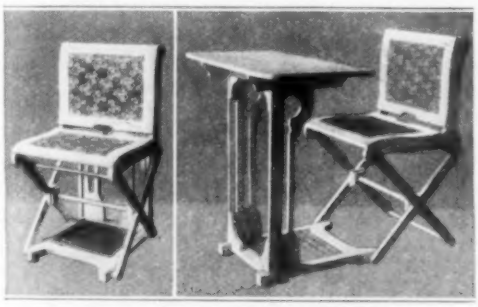
Tying a knot in yarn by hand takes only a moment, and is so simply and quickly done that any child can learn at once, but science, ever watchful for quicker and better ways, has made a machine to do it. It is a small apparatus, worn on the left hand, being held by a strap, as is shown in the top picture. Yarn is drawn over two hooks and the thumb presses a lever, tying the knot and trimming the ends, as indicated in the three lower pictures. With this hand machine the speed of spooling and winding is increased and the weaver can do more and better work because the knots are trimmed closely. Even the beginner always works a great deal faster with this device than by hand. When tying is done by hand, sometimes the yarn is soiled, but by machine this does not happen. This knotter is used in India as well as in the United States.

SWIMMING ON FISH BOARDS LATEST WATER SPORT

Swimming with fish boards has given a new zest to water sports. Modeled after various kinds of fish, the boards are made of balsa wood, lighter than cork. Near the head on both sides are small holes in the board for the hands. The rider lies down, his head above that of the painted fish. By kicking, the swimmer can move along at a good rate of speed. The boards are made in many lengths and variously colored. It is said that they are of great assistance in learning to swim, and will easily support a weight of more than 200 pounds.

FOLDING CHAIR AND TABLE OCCUPY LESS SPACE

Something novel in a folding chair and table combination has recently been sent to this country from European shops. It



Left: Table Folded Away behind Chair; Right: Table in Position Ready for Use

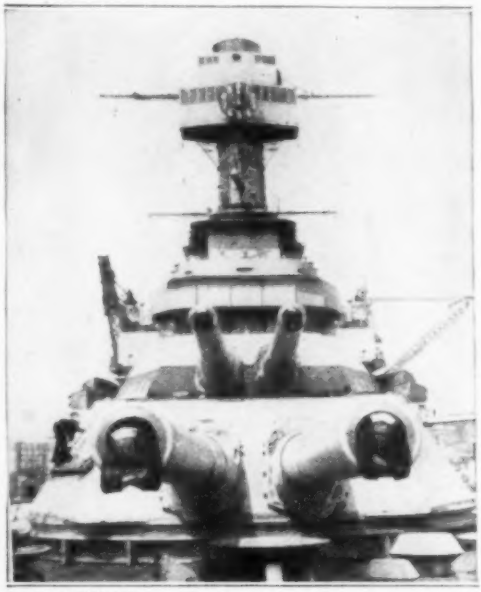
can be used as a study or tea table, and when desired the table may be readily folded under and back of the chair. Besides being compact, it is of pleasing design, well suitable for the porch or inside use. The chair is upholstered in a flowered material.

HOME-RUN SLUGGERS' BATS MADE IN SMALL SHOP

To turn out a bat used by big-league baseball players takes about two years. Second-year growth of ash is used. It is specially prepared, sun-dried, and weather-cured. Then the wood is turned on a lathe to the size desired and carefully balanced so that the greatest amount of force may be used by the batter in hitting the ball. In a small eastern shop, many of these bats are made for some of the best-known players.

U. S. NAVY'S BIGGEST GUNS GIVEN FIRST TEST

Four of America's greatest naval guns —the 16-inch long-range rifles of the "Maryland"—have just been given their



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Four "Aces" of the United States Navy's Long-Range Rifles, with a "Tar" in the Muzzle of Each Gun

first real test in target practice off Hampton Roads. The guns, which hurl a 2,450-pound projectile 38 miles, are 60 feet long, and are said to be the equal of the largest rifles of the British navy.

DOUBLE-HEAD SPARK PLUG CLEANS ITSELF

Of interest to motorists is a new spark plug that has two ends, each having two firing points. When one end is in use the exposed points act as an intensifier, as well as a trouble locator, thus serving to clean the working end. In case one set of points becomes damaged, the plug may be inverted and used as a regulation two-point plug. In this way a spare set of plugs can be carried under the hood, where they are always ready for use when needed.

CAMERA AID TO SCULPTOR IN MAKING BUSTS

Top, Bas-Reliefs, and, Below, Electrically Driven Drill Which Makes Them

Parallel Lines Thrown on Face of Subject That Aid in Making Bust

Two Cameras with Projector, in Center, That Throws Lines on Model in Chair

Only one sitting of a few seconds is required in making a sculptured model by the use of a photographic apparatus recently invented in the East. Less time actually is spent by the subject in posing for a sculpture than would be needed before the camera in making a portrait.

The development of this device, which combines the accuracy of the camera with the enduring, lifelike properties of sculpture, is hailed as the birth of a new art. Two cameras, set at different angles, are directed at the subject. A magic lantern throws an image of hundreds of straight lines on the face. In the photographs, these lines appear as curves, and aid the sculptor in making his model. Reproductions may be made in any material. The process is known as "photo-sculpture" or "cameography." It is like the method employed in surveying. Engraved upon the surface of a piece of glass are a series of fine parallel lines, spaced 150 to the inch. This is placed in the projector. Light from an arc lamp throws these lines on the image or subject from a distance of about 10 feet. If a solid object is placed at the point of focus, the lines will appear twisted when viewed from any position other than that occupied by the projector. Upon the distortion as recorded by the cameras, the subsequent operations depend, as they are used as a guide in making the carving. This is done by cutting a series of furrows which are parallel in plan, but follow the lines in the photographic record.

VACUUM HANDBRUSH IS RUN BY ELECTRIC MOTOR

Built like a carpet cleaner, a small vacuum handbrush has been made for cleaning clothing, upholstery, draperies, hangings, and furs. It is small enough to get into corners and remove lint and clinging hair. Weighing less than 3 pounds, it is driven by a small electric motor, and the dust is collected in a holder inside the handle.

DIG HUGE BASINS FOR OIL THEY CANNOT MARKET

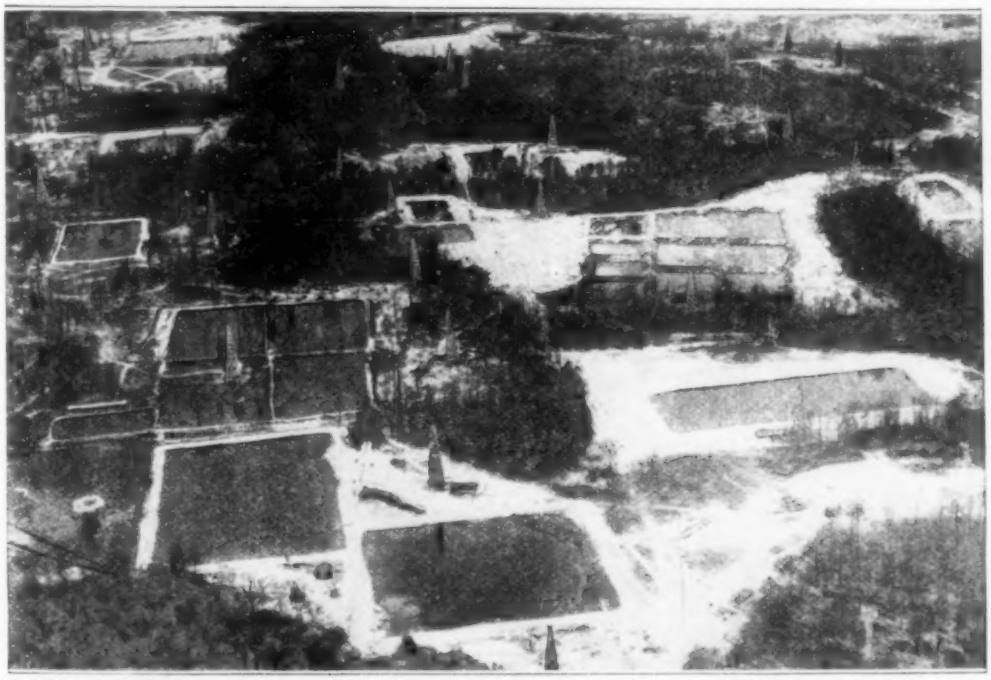
So rapid has been the development of the oil industry in many parts of the West that producers have been forced to dig huge basins in the earth to hold the output from their wells. Refineries have been unable to take care of the supply, and so the liquid wealth has been allowed to accumulate while more wells are being drilled all the time. Meanwhile, efforts are being made to construct storage tanks and pipe lines to handle the great output which means so much to automobilists generally. From above, the pools have the appearance of great mirrors that give back the reflections of the surrounding trees and oil derricks.

INDIAN'S KNIFE CARVES BEAR FROM TRUNK OF TREE

Using only a bowie knife, a deaf and dumb Blackfoot Indian has won fame by his carving of "The Grizzly in the Trap,"

Bear in a Trap Carved with Knife by Indian from Trunk of Tree

from a tree trunk. When exhibited in various parts of the country, the piece of sculpture won much praise. In making it, the Indian cut down a forest log and then whittled away until he had produced his masterpiece. The statue has obtained wide recognition for its creator.



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Huge Open Tanks Holding Supply of Oil in Western Fields Where Pipe Lines and Closed Tanks are Not Built Fast Enough to Receive the Continual Flow of the Valuable Fluid

CITY BURIED BY VOLCANO FOUND IN MEXICO

Near thickets of a tropical jungle in southwest Mexico, where ferocious wild beasts have their lair, engineers, looking for cement, have unearthed a prehistoric city buried centuries ago under a flow of lava from the seething caldron of Colima volcano, one of the most treacherous in America. Nooks containing strange pottery of a very old pattern were explored. Picture writing on the walls of several pyramids lost to the world for countless years, is being studied by learned men, who already believe that these discoveries indicate long ago Mexico was possessed of a remarkable civilization. Work of great builders and skilled artisans was found in pyramids so high that their tops were not buried under a lava bed that covered everything else. They are gigantic structures, having an average thickness of 20 feet and bases that reach more than 40 feet beneath the gravel beds under the lava. Living quiet, peaceful lives, save for occasional periods when they are obliged to flee to the hills for refuge when the volcano discharges its molten streams, farmers there now are content in tilling a fertile soil.

CHAIR-FLOAT FOR BATHERS MOVED BY PADDLING

Floating chairs, in which bathers may sit at ease and smoke or read newspapers while they dodge the summer heat, are

Bather Riding at Ease in Canvas Chair Hung from Life Preserver

popular at the beaches. They are made of balsa wood, which is lighter than cork, and are covered with heavy canvas. From the horseshoe-shaped float hangs a seat. The bather wades out to water above his knees, places his arms on the sides of the float, and is as comfortable as if he were in an armchair at home. Paddling with the hands moves the float in any direction desired.

¶A saving of 50 per cent in fuel during the cold season, and 40 per cent in the hot season, as compared with ordinary locomotives, has been guaranteed by the makers of a turbine locomotive for the Argentine State Railways.

FOLDING LETTER IS USED TO BRING BACK COINS

Three times the size of the ordinary postcard, a folding letter has been invented which may be mailed for a cent. One face is used for a forwarding address and three others for advertising matter. On the third fold an ordinary envelope is pasted, in which coins may be placed, safely protected by the stiff cardboard backing. This is addressed back to the original sender and may be mailed with a two-cent stamp.

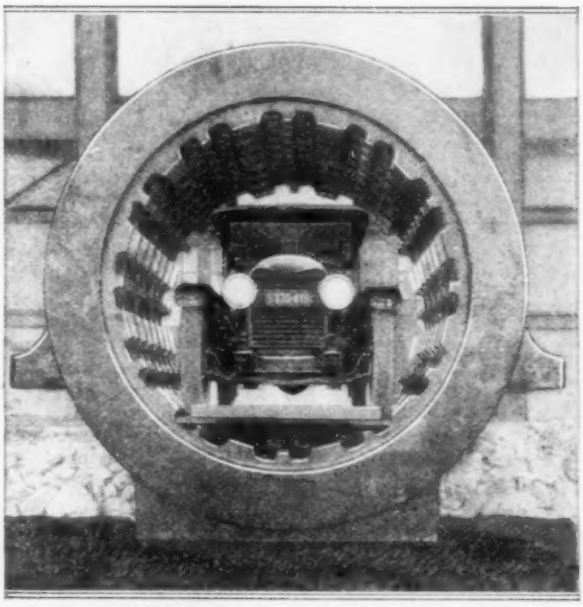
SEE-YOUR-STEP UMBRELLA HAS LIGHT IN HANDLE

No more falls or dangerous stumbles on dark, stormy nights, is the claim made for those who will use a patented umbrella with a flashlight in the handle. Just a press of the finger and the rays of the light are thrown downward. When the umbrella is closed, it may be used as an ordinary flashlight. The handle is scarcely any larger than that of an ordinary umbrella, and it comes in sizes that are suitable for the use of women.

Colima Volcano in Mexico, beneath the Lava of Which Scientists have Found Towering Pyramids, Marvelous Pottery, and Traces of an Ancient Civilization Long Since Forgotten

HUGE TURBINE CASTING SETS RECORD FOR SIZE

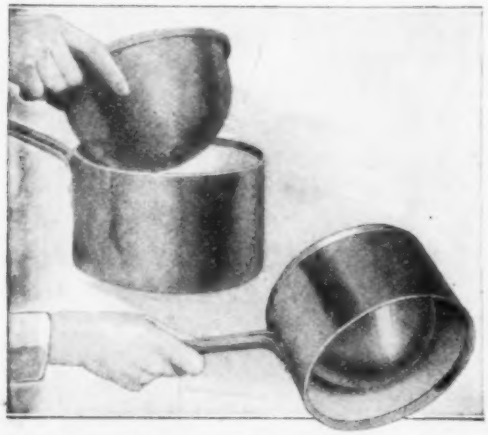
What is declared to be one of the largest steam-turbine castings ever made has been turned out by one of the plants of a motor manufacturer. Designed by a European engineer, it is said to have a new arrangement of the blades. In the ordinary turbine, steam driving against the blades, much as water does against the paddles of a water wheel, turns the center shaft. How the new turbine differs from the usual practice has not been made public, but it is said it is so well balanced that a child can turn it when it is installed. The casting was made in one piece and is said to have established a new record for size. So large is the bore that an automobile may be driven through it with top up without touching the sides.



Automobile with Top Raised Easily Placed inside Outer Casting for Steam Turbine without Touching the Sides

PAN FRIES WITHOUT ODOR AND SAVES GAS

Odors of frying are not noticeable and a 25-per-cent saving in gas are two features of a new type of frying pan, made in two parts, that has been placed on the market in Europe. Because heat is trapped in asbestos-lined sides of the pan, the saving of gas is said to result. Heat of the fat in frying seals up the cells of food as soon as it is placed in the pan, and so the cooking is odorless. Fat will continue to boil after the gas is turned off, it is said, because of the asbestos lining. It is also claimed by the inventor that several kinds of food may be fried one after the other, with no bad effect on the taste.



Odorless Frying Pan and How It is Taken Apart for Cleaning

GOLD LURES ADVENTURERS TOWARD THE ARCTIC

In a small schooner, with an auxiliary five-horsepower gas engine, two young Canadian adventurers recently left the comforts of home, passed through perilous ice fields floating down from Arctic regions, and sailed onward to newly discovered gold areas in the Far North, hoping to find fortunes under ice and frozen earth. A small boat was chosen for the trip because it is less dangerous to pilot through a sea of icebergs. Being only 35 feet long and drawing 4½ feet of water, it can keep well inshore where heavy fields of ice are not so menacing. The youths had planned to go on a steamer to the gold fields, but, because no one knew when the big boat would attempt the voyage, they cast their fortunes together and sailed away alone in their own little boat.

AUTO CARRIER IS HIDDEN WHEN NOT BEING USED

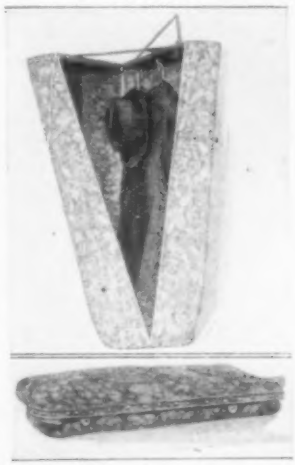
Instantly ready for service, but folded away on the running board when not in use, a rack has been devised for automobiles which does not mar the appearance of the car. Easily opened, roomy and rigid, it cannot be lost and may be used when needed the year round for sample cases, golf bags, and bundles. Slots are provided so that any luggage may be strapped to the rack, away from the body of the car. When not in service, it lies back out of sight and, being strongly built, adds to the rigidity of the running board.

RAILWAY ON TOP OF BUILDING TO CLEAN CORNICES

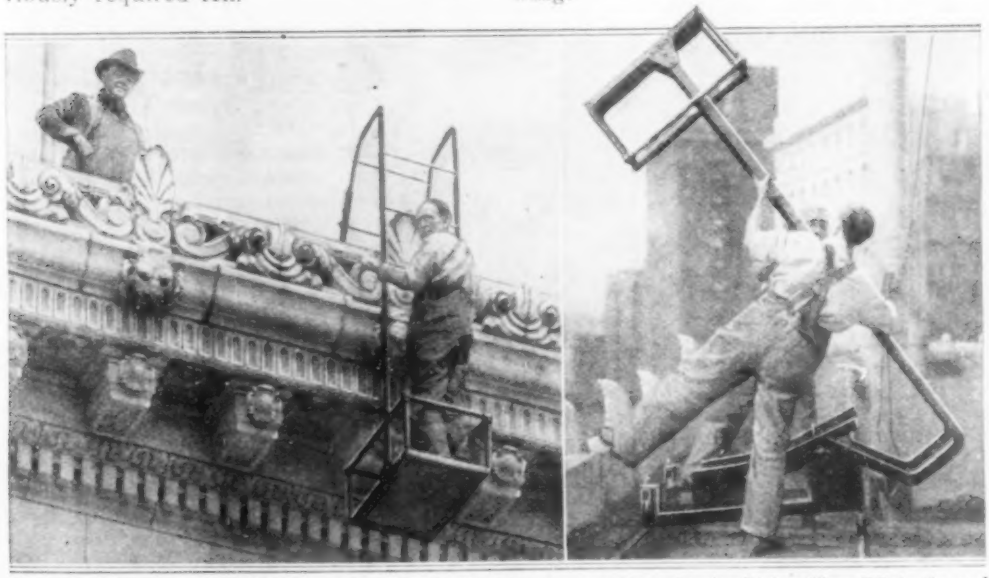
To aid in the work of changing cornice lights and keeping clean the terra-cotta façade of a western business block, a novel railway has been installed which reduces greatly the cost of this work and increases the efficiency of the janitors. Narrow-gauge tracks are laid along the sides of the structure. Upon these operates a three-wheel truck which has a short tower and a ladder which is suspended over the top of the building. The foot of the ladder contains a small cage in which the workman sits. A 200-pound counterweight maintains the balance of the device. By its use two men can do in two hours the same work that previously required ten.

MAKE CLOTHES CLOSET TO USE ON ROAD

For rooms that do not have clothes closets a novel dustproof wardrobe has been invented by a woman. It can be carried about and is large enough to hold hats, shoes, and other clothes. It can be opened and hung out of doors for an airing. The fabric body on the bottom acts as a weight. The top has metal fasteners that spread apart and fold. The covering is made to match the room where it is used. When not in use, it folds into small compass.



Encouraged by the success of an all-metal plane which carried eight passengers, German inventors are hard at work upon a huge airplane to weigh 1,000 tons. This plane will be designed to carry passengers across the Atlantic, and will have three hulls of light metal and a single wing.



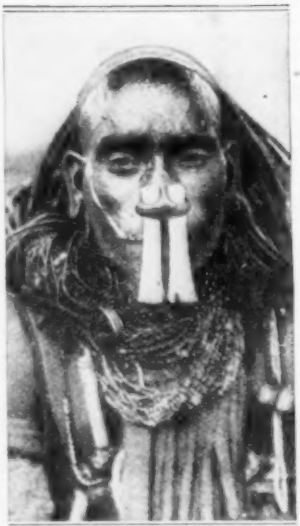
Cage Run about Top of Building on Track to Enable Workmen to Clean Cornice Lights More Efficiently, and How It is Lowered into Position Wherever Desired

DEVIL DANCE CURES ILLS, ISLAND FOLK THINK

Devil dancers and witch doctors in certain south-Pacific islands are still leaders of natives in their districts, and at certain times they put on head masks of strange design to scare away evil spirits as they dance. American missionaries are helping to abolish superstitions, but in many cases they have not been able to convince the natives that the so-called devil dancer cannot really cure sickness by hopping up and down from one foot to the other. Efforts also have been made to persuade the islands' young men not to wear rings on their fingers and toes.

IVORY SIGHTS ON GUNS FOR USE IN DARK

Ivory gun sights, one placed at the end of the barrel and the other in the center, are the latest improvement in the building of a shotgun. The small ivory rear sight, about midway between the end of the barrel and the hammer, and the large sight at the front, combine to correct twisting, one of the most common faults of novices in shooting. Another advantage claimed for the ivory is that the user can sight in the dark with greater accuracy. Hunters say that they are a great aid in teaching the beginner.



Strange Devil Dancers of South Sea Islands

PLAGUE OF CATERPILLARS STOPS RAILWAY TRAINS

Science tried to battle against a plague of caterpillars that swept across the foothills of a western state recently, destroying crops in its wake and smearing railway tracks so thickly that traffic was halted at some points. Scientists, who organized an army of students with poison pots, electric flashlights, and chemicals, were practically helpless before this destructive army of swarming insects, and so nature helped. Flies overtook the caterpillars as they mounted the crest of the coast-range foothills and a battle followed. Hour by hour the insect host was slain by the flies, while farmers aided by using long blowpipes to burn them. When the caterpillars crossed the plains they marched into towns, covering even sidewalks and railroad tracks an inch deep. As fast as they came, the flies laid eggs which hatched parasites that, in turn, killed off the invaders. Abandoning their man-made weapons, the scientific fighters watched nature take its course.

¶To tell when the business man will return to his desk, a new device with the notice on a roller moved by a thumbscrew, has been patented. The user turns the dial on which is printed "Will Return," until the hour he chooses appears.

AUTO BED TIGHT OR LOOSE AT TURN OF HANDLE

Easily carried in an automobile and wide enough for two persons, a bed has been built with a canvas cover which can be made as tight or loose as desired by turning a ratchet attached to the frame. Although designed for outdoors, it may be used in an emergency around the home. When folded up, it will fit on the bumper or running board of a car, and it weighs only 37 pounds.

JAPANESE WOMAN ARTIST PAINTS COURT LADY

Under the title of "A Mad Court Lady of Old Japan," a painting by one of the most famous women artists of the land of the Mikado has been exhibited recently in the East. Almost life-size, the picture is worked out in all the gorgeous coloring of the Orient. Its air of mystery has proved effective in drawing the attention of the crowds, who never seem

Painting by Japanese Woman Shows "A Mad Court Lady" of the Orient

to tire of gazing on the long coal-black hair, partially closed eyes, and flowing draperies of the figure.

¶ Under the lens of a microscope scientists now can cut a living human or other animal cell into two parts and study the divisions. Separating of these tiny units of life is made possible by an invention of a middle-western scientist. Glass needles are used in cutting the cell.

"LITTLE PRINCESS" OF CIRCUS IN RACE WITH GIANT

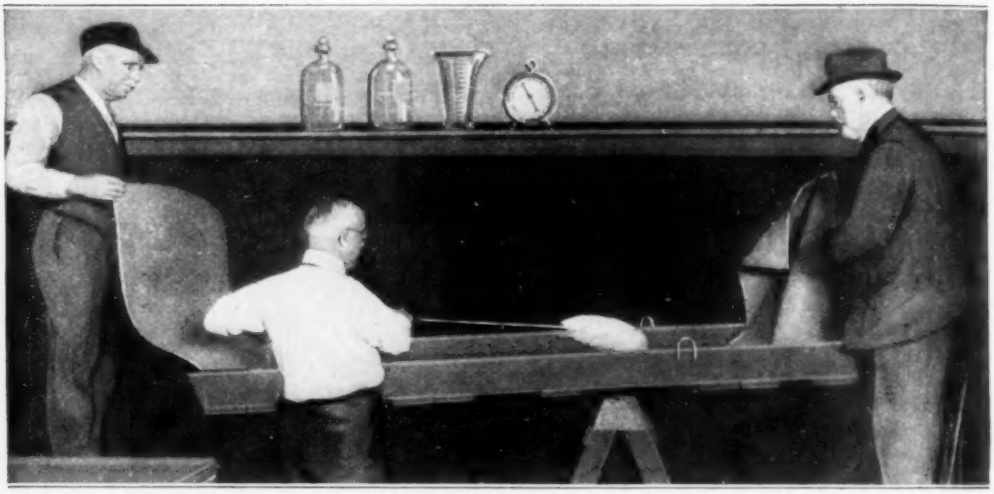
Which is the most popular, a giant or a dwarf? That is the question in a

Circus Giant Holding Two-Foot-High Midget on Board While She Plays Piano

unique contest between a midget, only 2 feet high, and a giant, who towers 8 feet 1 inch. Both are members of a large circus, and ever since they have been together there has been a friendly struggle between them to see which attracts the larger crowds. So far, the circus goers have been evenly divided between the platform of the "little princess," who is 23 years old, and that of the giant. With the children, the giant seems to be most popular, while the older persons show more interest in the "princess."

TENT PEG LIKE CORKSCREW

Shaped like a corkscrew, a tent peg has been invented which is easily put into the ground without the use of a hammer. The pointed end is pressed into the earth and the peg is turned by hand until it is in deep enough. It will stay set, even in the heaviest weather.



Three Men Developing a Photograph about 30 Feet Long and 10 Feet Wide: The Sheets were Washed with a Mop in a Specially Built Tray

HUGE PHOTO OF WILD LIFE NINETY-SIX FEET LONG

What is declared to be the largest photograph of the kind in the world is being completed by a middle-western museum after more than two years of work. At present the picture is 10 feet wide and 96 feet long, but when completed it will form a panorama 265 feet long. To complete the final picture, hundreds of smaller ones were taken over a stretch of territory covering 250 miles and extending through Indiana and into Illinois. For their development, the photographs required a specially constructed tank, 7½ feet by 5 feet and more than a foot deep. This was rocked by several men, while a boy in boots spread the chemical used. When assembled, the pictures were tinted in natural colors to convey a realistic idea of the wild life of the region.

¶ Barber shops in many cities of Europe do not use the striped pole, but instead a small brass bowl is hung over the front door. Most of the shops are for both men and women, the sections being divided by screens.

Section of Huge Panorama Photo of Wild Life Made in Two Years by Experts of a Museum: When Completed, It will Be About 300 Feet Long and will be Tinted in Natural Colors

WOMEN FREED BY SCIENCE FROM HOURS OF TOIL

How much electricity has done in replacing servants and saving the amount of work once done by the housewife, is seen in some recent figures stating that in American homes there are now being used more than 20,000,000 electrical household appliances. The amount of time saved for the housewife by use of these inventions cannot be estimated, but it is asserted that the percentage of servants is now less than half what it was before electricity was harnessed for the home. Seven million electric irons are used in America. Nearly 4,000,000 vacuum cleaners do the labor of a broom and dustpan. Three million electric washers do in a few hours what, a decade ago, required an entire day's back-bending labor over a tub and washboard. One hundred thousand owners of electric dish washers keep their hands out of soapy water now, and more than four times that number do their sewing on machines run by motors. There are more than 100,000 electric ironers in use in homes.

FOUR-SPRAY TAR SPREADER DOES WORK OF MANY

By the use of four sprays instead of one brush, the work of four laborers is being done with one road tar sprayer

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Hand-Pumped Spray for Spreading Tar Does Work of Four Men and Saves Material

now used in Europe. The invention, made of gas pipe, simple to build, is pumped by hand and spreads tar evenly, sparingly, and quickly, on the same principle that a paint air brush works. The four nozzles are far enough away from the workman so that he will not have to walk through the tarred surface. Use of this sprayer also results in a saving of tar, it is claimed.

FALSE ARM STEERS AUTO BY NOTCHED WHEEL

Cripples who have lost an arm can run autos by use of a special steering wheel and false arm, the invention of a former

Metal Arm That Enables Crippled Motorist to Drive Car through Traffic

soldier who has been granted a license to drive his clever device. The steering wheel is notched. A lever at the base of the artificial arm fits into the little gaps in the wheel, and thus keeps the front wheels under control. The natural arm can be used to work a signal, hand brake, or starter. A slight pressure on the stump, which fits into the upper case of the steering arm, will move the wheel. The lower part is on a hinge. This device is now being made for right and left sides. If it is attached to the right shoulder, the starter, hand brakes, and signals must be on the left side.

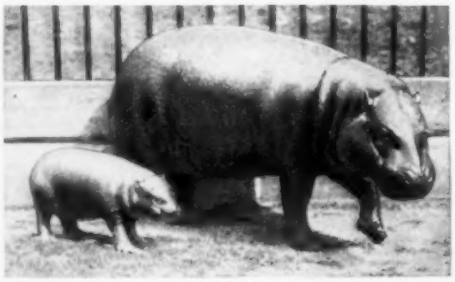
LIGHT IN MIRROR AIDS IN SHAVING

By using a bull's-eye set in a shaving mirror hung over an electric light, an English inventor claims to have solved the problem of providing good vision without glare for shaving. The hole is normally at the bottom of the mirror. It may, however, be turned around to bring the light to the top for hair-dressing. The mirror will fit over any electric light and may be adjusted in any direction to suit the user.

HOW SCIENCE KEEPS ANIMALS HEALTHY IN ZOOS

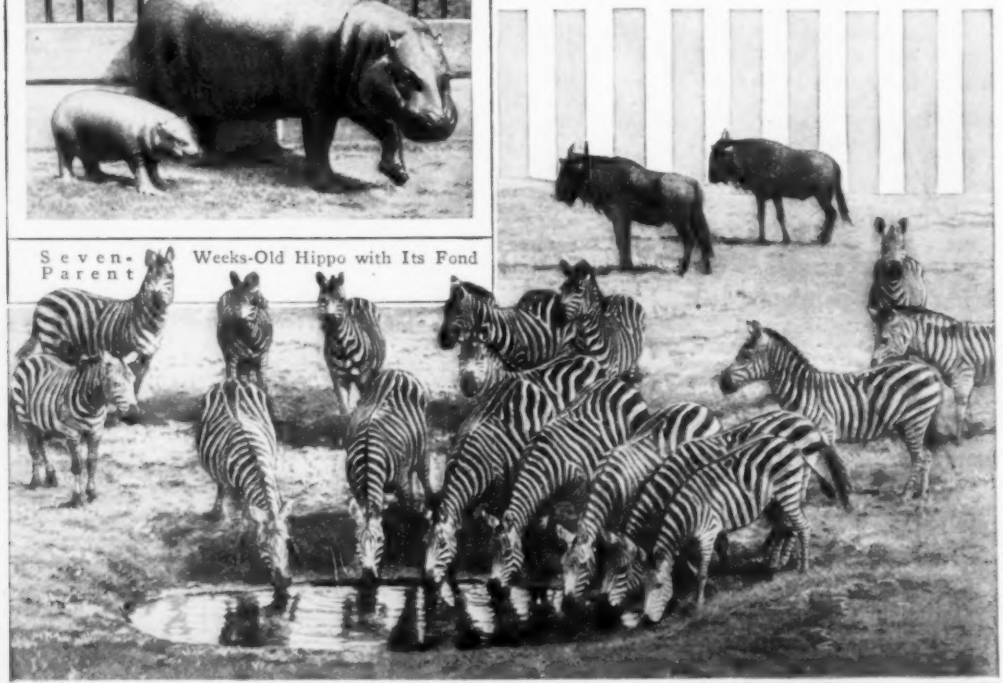
Terrier on Running Board of Auto Rides in Sidecar

Giant Deep-Sea Sawfish, 26 Feet Long and Weighing 3,240 Pounds, with Its Captor



Seven-Weeks-Old Hippo with Its Fond Parent

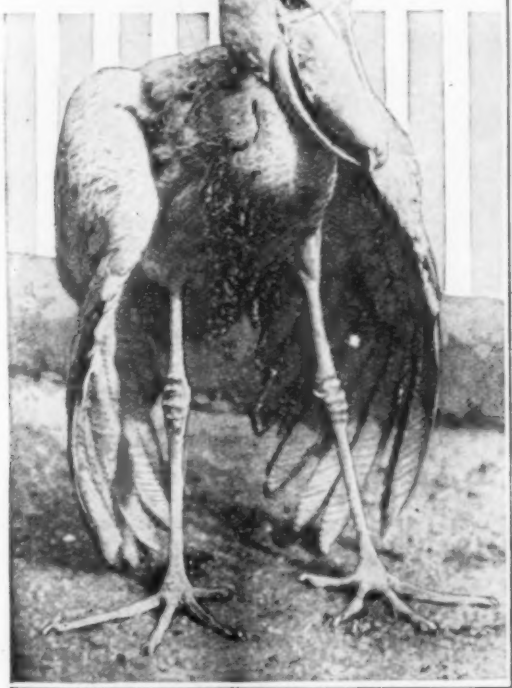
Gathered together from every part of the world and kept in close confinement to which they are not accustomed, animals in the zoo present a real problem to science. Although their health is guarded closely, the temperature of their cages regulated to simulate the conditions under which they live in their native wilds, and their food carefully looked after, they often require the attention of doctors and even dentists. During the winter months, they become fat and sluggish. So, in the spring the amount of food given them is cut down until they regain their accustomed sleekness and vigor. One of the first signs of illness is the refusal to eat. This results in an immediate visit from the doctor and often the forcible use of medicine, which all animals dislike as much as most children. In many cases, fits of distemper and unusual restlessness have been traced to toothache. Sometimes the cavities are filled, but more often the tooth is extracted because of the difficulty of holding the animal quiet during a more lengthy session with the dentist. In general, all of the animals are more gentle when young. With advancing years they often become morose and sullen. Trainers seldom attempt to train a full-grown animal.



Herd of Zebras, Known as One of the Shiest Animals of the Wilds, Snapped at a Water Hole in British East Africa: The Photograph was Taken at Long Range

CHILDREN OF THE WILDS BROUGHT UP ON BOTTLES

Guarded as carefully as any human baby, it is often found necessary to separate little children of the wilds, who are born in captivity, from their parents. In such cases they are usually fed milk from bottles and are weighed daily to be sure the diet agrees with them. In other instances, they are turned over to a foster parent to be mothered. Deprived of their natural surroundings, they develop a real affection for their keepers, but seldom does this extend beyond their maturity, when their wild instincts become more fully developed. As babies, however, even the wildest animals are safe and often mischievous playfellows. Tiger cubs love to romp and play like kittens. Little bears, scarcely larger than rabbits, will gambol about in the sun all day long and then curl into furry balls in the corner of their cages. They usually are born during the winter months when their mother is hibernating, and at first are all paws and head. When spring comes, they are big enough to follow her about in search of nuts to satisfy their ferocious appetites. Because of their life in the open, they are said to be less troubled when young by sickness than human children, whom they resemble in many ways.



One of the Most Remarkable and Savage of African Birds, the Shoebill, in London Zoo

Three-Hundred-Year-Old Turtle being Coaxed to Pose for Its Photograph

How Tiger House Cat, Seven and One-Half Months Old, Takes Its Meals

Young Wild Rabbit, Half-Starved When Found, being Brought Up on Bottle

An African Explorer Feeding One of His Jungle Pets That Lost Its Parents

CIGAR ENDS KILL INSECTS, AND ASHES AID PLANTS

When the average man has finished smoking his cigar or cigarette, he throws it away. But the saving person, who

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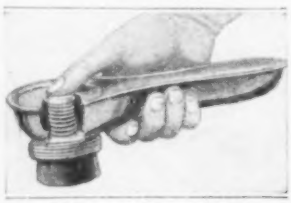
Frugal Smoker Who Saves Ashes for Plant Fertilizer, and Butts to Kill Insects

wishes to get everything of use out of the tobacco, saves the ends and the ashes. The butts have been found to be of value in killing certain insects that harm plants, and the ashes make an excellent fertilizer, so plants will grow more healthy. Nicotine, too, is worth saving. In a city in Europe there is a man who collects ashes and nicotine which bring a very high price. Another frugal smoker even saves partly burned matches to use in starting grate fires.

POLISH OR PAINT CARRIED IN HANDLE OF BRUSH

Greater economy and convenience are claimed for a brush that carries boot blacking, furniture polish, wood stain, or paint in its handle. The flow is controlled by pressure of the finger and thus is evenly and easily applied. It may be used for cleaning clothes, painting, shining shoes, furniture polishing, type cleaning, and many other purposes.



RUBBER FOR SCRUB BOARDS TO SAVE MUCH LABOR

On the same principle that the eraser on pencils rubs out marks on paper, a scrub board with a rubber face has been made to take out the dirt in clothes. The rubbing surface is heavy and resilient, so that it will not make the knuckles sore. It will not rust, crack, or break, and is claimed to last for a considerable time.

COMPASS AND GRADE DIALS MADE FOR MOTORISTS

Following the trend of aviation, the compass has found its way to the automobile dashboard. With the vogue of touring and cross-country driving this is an added feature of great importance. Another interesting device for the motorist indicates accurately the steepness of the hill or the decline. This not only satisfies a natural curiosity but enables the driver to keep a dependable check on the performance of his engine. If a car that has been able to take a 20-per-cent grade easily suddenly shows a marked falling off in its hill-climbing ability, as attested by the indicator, remedies may be sought before the trouble leads to more serious consequences. It is also useful at night when the surrounding darkness hides the steepness of the grade from the man at the wheel.

CORK WADS IN GUN SHELLS

Greased cork wads are being used in gun shells to give greater speed and driving power. Formerly all shells had felt wads between the powder chamber and the shot. The two advantages claimed for the greased cork are that about seven per cent greater velocity results and that the gun barrel is kept from pitting.

6,000,000 POUNDS OF MAIL HANDLED IN ONE DAY

Above: Mail Pouring through New Postal Station, Which is Equipped to Handle More than 6,000,000 Pounds of Incoming Matter Every Day. Below: Moving Platform, Endless Chains, and Automatic Chutes, Forming Great Interior Transportation System for Handling Letter-Filled Pouches

Every device known to science and engineering for handling mail has been used in a new postal station at Chicago. Endless belts, overhead carriers, moving platforms, and spiral chutes avoid delays and blockades. It is estimated that more than 6,000,000 pounds of mail can be received, sorted, placed in sacks, and delivered aboard trains daily at the station. After the pouches are filled they are picked up on hooks attached to endless chains running along a loading platform. When the proper car is reached, the sack is automatically dropped. One chain, it is estimated, will handle 150,000 sacks daily.

"STUFFED" ANIMALS SO REAL THEY SEEM TO BREATHE

"Animal architects" is the name that should be given to government taxidermists, for they build up, in lifelike form, the outer structure and clothe it with its own fur, or skin, so that it seems almost to breathe. Skill and patient labor work the miracle, for such it seems after the modern animal sculptor has turned a few bleached bones and limp bit of fur into an exact replica of some roving denizen of the wild. Although the art of mounting animals is almost 300 years old, it has been greatly improved by the government experts, who combine a knowledge of anatomy with that of modeling. New methods have supplanted the old process of "stuffing," and now the skins are put over hollow plaster figures. Several of the expert workers have been in the government service for more than 16 years.

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Two Animal Sculptors at Work on a Small Model of an Antelope, Which Later will be Enlarged for Display in Some Natural-History Collection

AIR EXPRESS TO FLY BOTH BY DAY AND NIGHT

To carry parcels and small packages, one of the larger express companies has announced that it is planning a regular airplane service between Chicago and New York. It was declared that this concern was not only ready to enter into a contract but also to exploit the faster service, advertise rates, pick up shipments at points of origin, and deliver them for air transportation at main-line air ports. Regular commercial airplane carriers, under the plan, would fly day and night, resulting in a great saving in time over even the fastest express trains.

HOUR GLASS ON PHONE MARKS TIME YOU TALK

Something new for keeping track of elapsed time at the telephone is an hour glass which is easily attached to the telephone post. When the glass is inverted, it takes five minutes for the sand to run through, so that a glance while talking tells the speaker how much time remains for the conversation.

"LOUD SPEAKER" GUIDES VESSELS TO PORT

Marine engineers at an English port have devised a voice-amplifying apparatus which, it is claimed, greatly reduces the danger of accidents to large vessels approaching their docks in a busy harbor. Confusion of signals, sent out by wharf hands and tugboat tenders, is a common cause of delay to steamers, and sometimes results in collision. With the new "loud speaker," a dock superintendent may throw his voice out over a long stretch of water to the helmsman of an incoming ship. Complete docking directions can be given in much less time than is required when whistles and bells are used. The amplifier is so large that a crane is necessary to swing it into position for use. An attendant, mounted on the hoist, points the instrument in the proper direction.

Huge "Loud Speaker" being Raised into Position by a Derrick So That Passing Vessel may be Hailed by Harbor Master

PUMP MAKES FIRE-FIGHTER OF ANY AUTOMOBILE

To help in fighting fires in small towns, a pump has been devised which may be placed on any automobile. Operated by the motor, it will throw between 200 and 250 gallons of water per minute at 20 pounds pressure. The pump may be attached to the car in two minutes and may also be used on construction work or for irrigating. So powerful is the device that it will throw a stream 26 feet into the air.

KITES AND RADIO AERIALS SOURCE OF DANGER

When Benjamin Franklin flew his kite he had the air all to himself. There were no electric wires to hinder him. But today the danger to boys who fly kites and build radio aerials has become so great that advertisements warning them have been printed in the East. One said that, while the youths can still have practically the entire sky to themselves for their sport, if they do not "send her up" near electric wires they will avoid three things — interruption to their kite-flying, stoppage of the telephone or light service, and the risk of grave danger from shock. Many complaints, it was said, had been received of aerials being strung so near to power wires that a storm might cause them to come together with disastrous results. Wet kite strings, according to the experts, would carry enough current to cause a shock, and might even start serious fires by resulting in dangerous "short circuits" when wrapped about the wires.

TRAVELING SCREEN IS USED AS CLOTHES CLOSET

Made in sections so that it can be folded and carried as baggage, a screen may be used as a closet or to shut off part of a room. Brass hooks inserted around the inside are provided for hanging clothes. The panels open like doors and are fastened with a latch or hook.

DISHPAN RAISED TO AID THE BUSY HOUSEWIFE

To do away with the bending which makes dishwashing such a disagreeable task, a clever inventor has designed

Removing Wire Screen from Bottom of Dishpan That Has Adjustable Legs

an elevating device consisting of a skeleton pan with a wire bottom. At each corner are bolts attached to legs which may be fixed at any desired height. A nut controls the height. The wire screen at the bottom of the pan is removable to aid in cleaning.

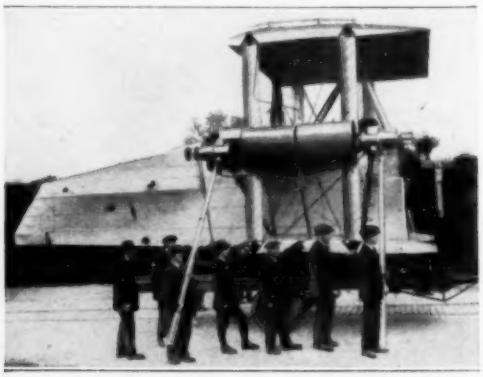
SWEDISH PROGRESS SHOW AGLOW WITH LIGHTS

Thousands of electric lights that lend a glow to every part of the grounds have been installed in the Shrine of Sports and other buildings, as well as all of the walks and drives, at the Tercentennial, or 300-year anniversary exhibition, being held in Gothenburg, Sweden. The pleasing electrical effects bring out in sharp relief the artistic lines and architectural beauty of the structures, and it is said by those attending the exhibition that the night view is superior to that of the daytime. A small lake at the portal of the sports hall is surrounded by a light-festooned promenade. Each building is devoted to some branch of industrial, commercial, and recreational progress made by the country for more than three centuries, and many interesting memorials and trophies are on display. Practically all of the Scandinavian countries have joined with Sweden in the celebration.

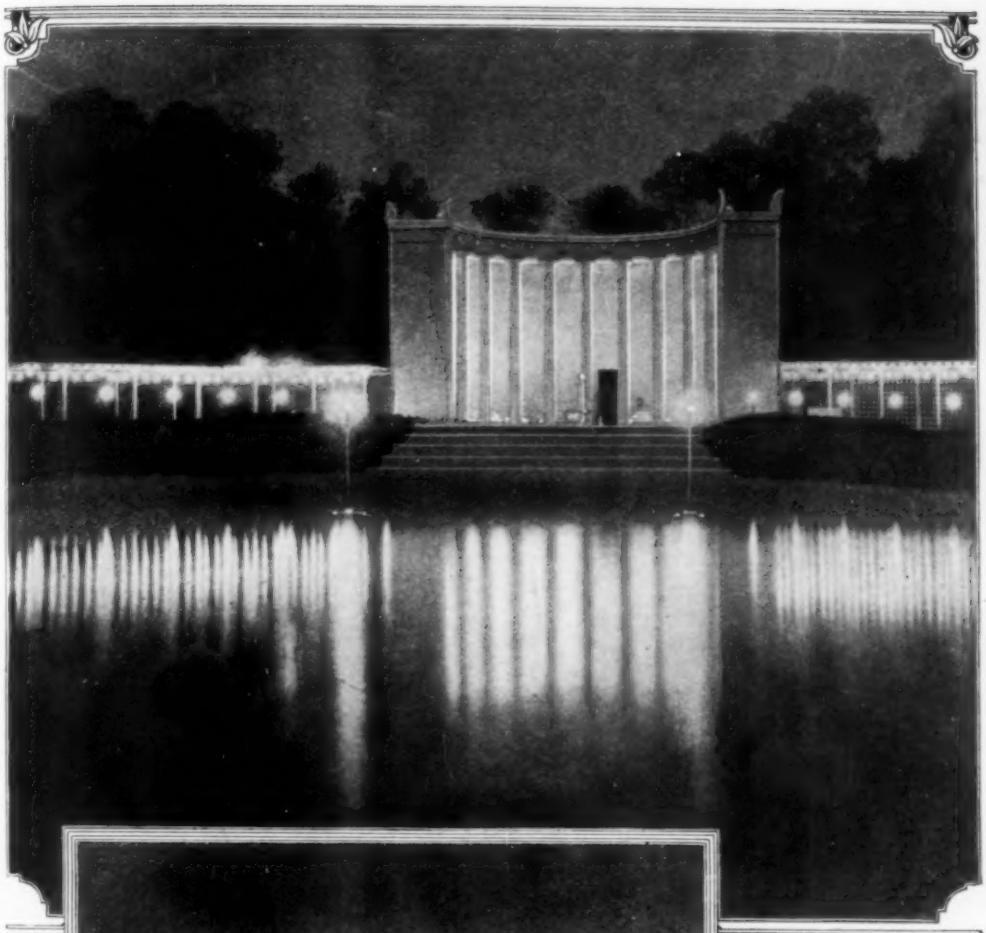
Extending the application of raised characters which enable the blind to read, a French inventor has devised a thermometer for the use of the sightless. A pointer indicates the rise and fall of the mercury. The blind reader has only to feel with his fingers in order to "read" the temperature.

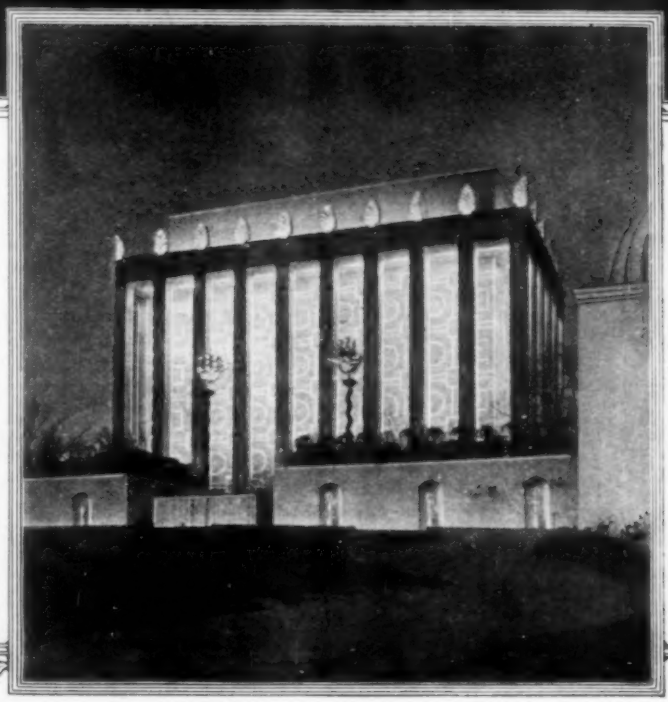
BRITAIN BUILDS MONSTER BOMBING AIRPLANE

Built entirely of steel, with bullet-proof engine housings and cabin, a monster bombing airplane has been completed and delivered to the British Air Ministry. The huge bomber, which was assembled in secret, is said to be the largest ever built. It has four propellers, any two of which are capable of keeping the machine in the air if the other two are disabled. The armor plate in the plane is designed so that it will withstand machine-gun and shrapnel fire.



Left: Rear View of Great Britain's Largest Bomber, en Route to Airdrome. Above: Side View, Showing Armored Engine Housings





Millions of Blazing Electric Lights Outline the Architectural Beauty of the Buildings of the Tercentennial Exposition in Sweden to Observe Three-Hundred-Year Anniversary; a Small Lake at the Entrance of One of the Halls Serves as a Mirror to Reflect Back the Lights in All the Colors of the Rainbow; in Another Structure, the Lights are Placed behind Towering Columns in Geometrical Designs So That the Building Has the Appearance of a Glowing Jewel, Guarded by Dark Pillars of Steel and Surmounted by a Crown of Fire

ARMY FINDS WAY TO KEEP ITS MESSAGES SECRET

So small that it can be carried slung across a man's shoulder, a combined telephone and telegraph set has been de-

Telegraph and Telephone Set Built by Army Engineers to Send Messages without Detection

vised by U. S. Army engineers which makes it possible to send messages without fear of eavesdroppers. Known as the "buzzerphone," the instrument is so built that telephone and telegraph messages may be sent at the same time without interfering with each other. When connected to a line, it is impossible for

Batteries and Wiring Inside of the New Army "Buzzerphone" Devised to Defeat Spies

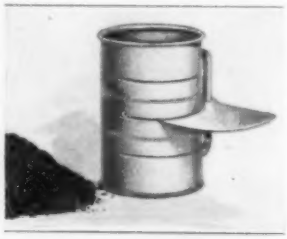
anyone to pick up the telegraphic signals by what the engineers call "inductance"—a favorite method of spies. Telephone conversations over the line, however, cannot be so safeguarded.

RACING AUTO TAKES GAS AND OIL "ON THE GO"

While racing along at a speed of nearly 50 miles an hour to break a record, an automobile recently was supplied with gas, oil, water, and relief drivers without stopping the car during a 3,155-mile run made in 50 hours 21 minutes. Although three stops were made for tires during this time, the engine was kept going without pause. All the other supplies were taken aboard, without stopping the machine, from another car which ran alongside during the period of delivery.

COFFEE MEASURED BY SLIDE IN BOTTOM OF CUP

To use the right amount of coffee for one, two, three, or four cups, a tin cup with sliding bottom has been invented. When filled level with the top, there is enough coffee for four cups. A sliding base, moved from the handle, is pushed into the space marked for the other amounts. As this cup is marked from the bottom up, the user does not pour back and forth from the measure to the coffee can.



AIR SURVEY OF ALL ALASKA TO BE MADE BY NAVY

Aerial maps of Alaskan territory will be made this summer by two naval planes carrying a full equipment of photographic material, mapping cameras, and special high-powered lenses for distance work. During the operation the planes will make their home on a warship anchored off the coast. It is expected that information of value to conservation and development projects will be obtained in this manner from the air in territory that is otherwise almost inaccessible. Aerial maps will be made by the planes, which will furnish information that would otherwise take months to obtain. It is also planned to make a survey of the Alaskan oil fields and of the seal herds in the near-by waters, and information of value to aviators will be sought.

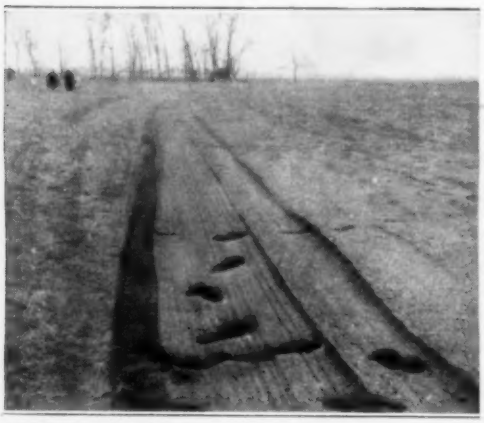
Record-Breaking Automobile being Given Gas, Oil, Water, and Relief Drivers, without Stopping the Machine, from a Supply Car Racing beside It during a 3,155-Mile Run

TRUSTY PLOW SOON MAY BE ONLY A RELIC

BY FRANK RIDGWAY

Rough Soil at Bottom of Picture Shows Condition of Ground after It had been Turned Over with an Ordinary Plow; That in the Distance Shows Effect of the Use of the Rotary

BY the side of the old spinning wheel and loom may soon be placed a duplicate of the modern moldboard plow.



Seed Bed after the Rotary Plow had Gone over the Stubble, Showing Absence of the Open Furrow

Rusty heaps of disks, harrows, rollers, and drags will be left in fence corners, for a new soil-milling machine has been invented by a Pacific-coast engineer to take the place of agriculture's symbol, the plow, and the long string of implements that follow it in making the seed bed.

Lacking a better term, the inventor calls his device a rotary plow, but it is more than that. In his imagination he has put plows, harrows, disks, rollers, etc., into the melting pot, and, in reality, molded a single machine that does the work of all.

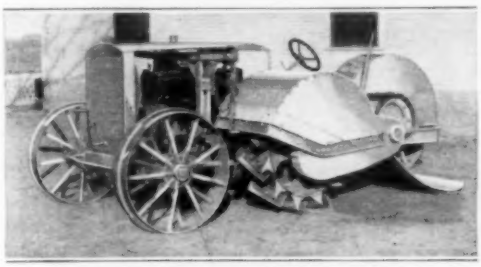
While the ordinary plow turns up or inverts the soil, this machine strikes downward with a series of obliquely set blades or shears. These saw their way through the soil with 24 shears striking the ground at the rate of 53 every second, pulverizing the dirt so finely that the clods can all be passed through a ¼-inch mesh sieve.

No combination of implements in existence today, even with an endless chain of operations, could be put in a field and leave the ground in so good a condition

Rotary Plow Going over Field Covered with Sunflower Stalks 10 Feet Long

as does this machine, it is claimed. One trip thoroughly pulverizes the soil, makes it loose, aerated, and level, ready for the planter or drill. Furrows are done away with, the soil is powdered and piled up immediately back of the rotary drum, and then leveled by a trailing drag attached behind.

Vegetable matter, cornstalks, small-grain stubble, weeds, sunflower stalks, long tough stems of grass, cane stalks, and straw left on the surface of the ground from the previous crop, is chopped up into short pieces and uniformly mixed with the fine soil from the top to the bottom of the seed bed. In an oat-stubble field where the ground was covered with a 12-inch layer of fresh manure mixed with tough straw, the new plow chopped up the material into fine pieces and distributed it evenly throughout the seed bed, where it will ferment,



Drum Studded with Shears Which Make It Possible to Plow within Five Feet of the Corner Posts

unlocking the plant food that will soon become available for the next crop.

SLEEPING COACH FOR AIR OR RAILWAY SERVICE

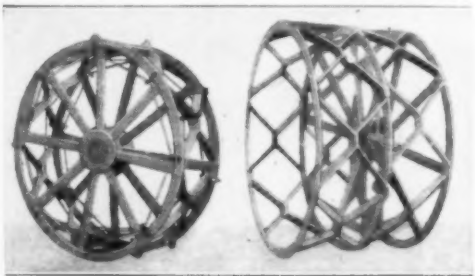
Plans for an aerial Pullman which will run on ordinary railway tracks or may be attached to an airplane, are being examined by the British air-craft authorities. A great, slim, metal saloon, like a long, tapering Pullman car, is the basis of the idea. This coach would be covered with gleaming sheaths of light metal and would rest on a long framework with wheels to run along railway tracks. Having both day and night accommodations, it would be backed into a depot to receive its passengers. When they are aboard, an engine would take it to an airdrome outside a city, where it would shed its wheels and be attached to an airplane body. Landed at its destination, the flying car would go through another quick change and then be taken to a city terminus on railway tracks.

WEATHER DIAL ON TOWER INSTEAD OF CLOCK

On the tower of a museum in a European city is a huge barometer dial 18 feet across and with a gilded hand weighing 100 pounds. If the hand moves to the right, people know that good weather is coming, but, if it sways to the left, bad weather is on the way. Down on the main floor of the building are the parts of the actual barometer, from which the weather indications are transmitted by electricity to the dial.

"SQUIRREL-CAGE" WHEELS USED FOR TRACTORS

Queer-shaped wheels have been devised for use on a tractor, which give it a better grip in soft ground or on steep grades. They look much like huge squirrel cages, and cannot fill up, as sand or mud will drop through them. A test was made, first with ordinary tractor



Skeleton-Tread Tractor Wheels Designed to Give Better Grip When Moving over Soft Ground

wheels, and then with the "squirrel cages," to find out which slipped the more in heavy travel. It was found that the ordinary wheels slipped more. The cage wheels also made better speed, both on level ground and on the slopes.

Natives of Indo-China Raising Water to Their Fields with Buckets: Modern Irrigation Methods have been Unable to Overcome the Traditions and Displace the Crude Systems Used for Ages

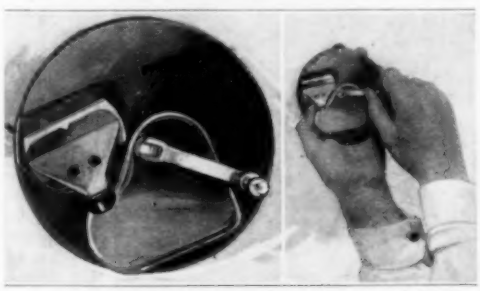
ANCIENT FARMING METHODS USED IN INDO-CHINA

In a day and age when engineers of the western world are announcing plans for reclaiming millions of acres of arid lands through irrigation projects involving huge dams and the latest machinery, it seems almost incredible that in the remote sections of Asia human ingenuity has not progressed a single step from the crude methods used by the early Egyptians in raising water to flood their fields. Yet, in Indo-China, the most primitive of all ground-watering devices — buckets, suspended on strings between laborers — are being employed, much in the same manner as by the first tillers of the soil.

By means of this simple system, the natives are able to irrigate only a few acres of land each year, and this generally is devoted to the rice crop. Though there is a great waste of labor, these humble farmers are content to do as their forefathers have done for generations before them. While two men may operate a single-bucket device, in raising water from a river, the custom is to attach two buckets together and use four laborers, two on each side.

RAZOR SHARPENER IMITATES BARBER'S MOTION

Something new for those who use a safety razor is a sharpener which strops the blade with a motion similar to that used by a barber. After the blade is inserted, a crank is turned, causing the edge to come in contact with a revolving strop. At every second turn the blade is raised, and reversed before coming down to meet the strop again. A small lever clamps the blades firmly in the holder. Either single or double-edge



Turn of Handle Strops Razor Blades with Motion Similar to That Used by Barber

blades may be honed. When not in use the crank folds flat, giving the device a compact appearance.

LIFE-SIZE TOY ANIMALS MOVE BY ELECTRICITY

Life-size elephants, tigers, camels, clowns, and animals that move about almost as if they were living, are being

Making Life-Size Papier-Mâché Animals That Move, in an Eastern Toy Shop

made out of papier-mâché in an eastern toy shop. Making these animated animal toys is a new business in which sci-

Putting Final Touches to Human Figures First Designed by Artist on Canvas

ence, art, and imagination are combined. The animals and clowns are first designed by an artist who paints figures on canvas. Paintings are copied by a sculptor who models in clay; casts follow. Molds are filled with absorbent paper and paste, and are baked 12 hours at a temperature of 200 degrees. The figures are then painted several times, equipped with electric motors, wires, and pulleys, and are then ready to perform.

¶In the early '30s there were steam automobile busses in regular use in England. One was called the "Autopsy," an example of the grim humor of the time. This would indicate that the motor car is more than 90 years old.

Flaming Forest of Derricks Turns Night into Day in Recently Opened Western Oil Fields Where Pumps are Now Drawing 10,000,000 Barrels of Liquid Wealth a Month from the Earth to Keep America Running on Wheels. After Darkness, the Glare of the Electric Illumina.ion is Visible for Many Miles

CITY OF FLAMING LIGHTS BEACON OF WEALTH

Out in the Far West today oil lures thousands as a quick route to wealth, just as gold raised hopes of easy money in the hearts of those pioneers who, back in '49, made the great trek across unexplored country. Spots that three, five, or ten years ago were barren and deserted, places that were scorned as "No Man's Land," now are the Mecca of men who see possibilities of a "strike." Oil regions are humming with activity day and night. When darkness falls, a city of flaming lights appears, illuminating the sky for many miles around, firing the imagination and the enthusiasm of all who see it.

BINS UNDER TABLE TOP SAVE BENDING

Space for sugar, a flour bin large enough for a small sack, and a drawer

Sliding Porcelain Table Top Gives Easy Access to Many Bins Hidden below It

for knives, forks, and spoons, are covered by a sliding porcelain table top in a new labor saver for the kitchen. The table is the average height, 33 inches; the top slides back and forth, thus enabling the housewife to dispense with the bins usually placed below.

HEARING THROUGH A CANE TO AID THE DEAF

To aid the deaf, a cane with a fully equipped telephone system has been devised. In appearance, it is exactly similar to an ordinary walking stick, all of the instruments being concealed inside of it. In the knob, however, is a highly sensitive telephone receiver. One side of the knob is flat and perforated. This is placed against the ear when sitting at a concert or talking with a friend in the street. By turning a small silver screw, the instrument may be adjusted to the hearing capacity of the person using it. Electricity is supplied by three flashlight batteries in the neck of the cane.

OBSTACLE RACE TO TEST SOLDIERS' ENDURANCE

Races form an important part of the training of soldier cadets in England. Difficult barriers are erected in the path

Huge Iron Half-Cylinder is Used as Obstacle in Race to Train British Soldiers

of the runners, who must display speed, strength, and climbing ability to get over them. One obstacle, used by the Royal Military Academy in a recent meet, was shaped like a half-circle, and was 10 feet high. Another, and even harder one to get over, was a series of two wooden

Long Boards in Form of Tent Top Fail to Prove Real Hindrance to Racers in England

gables, having smooth sides and steep angles, joined like the teeth of a saw.

¶ To save time, a European inventor has devised a way of tempering saw teeth with electricity. It is said a skilled workman can temper 400 teeth an hour by this method. An increase of 20 per cent in output was noted in one sawmill where it was used.

Below: Fumigating a Camel to Kill Skin Germs. Above: Right, Close-Up of the Gas-Tight Bag around the Neck; Left, Camel being Treated by Dentist

MEDICAL TREATMENT ENABLES CAMELS TO ENTER U. S.

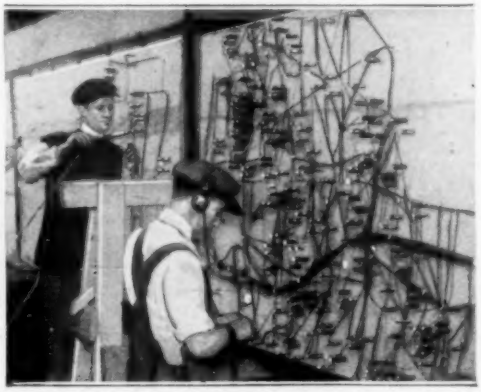
American customs officials are vigilant in every corner of the globe to insure that no disease carriers, human or otherwise, are permitted to embark for the United States. A striking example of this alertness was afforded recently when a number of camels arrived at Hanover, Germany, from India. These animals were consigned to an American film company, for use in an Oriental scene. Upon examination, the American customs authorities refused to issue health releases for the animals, claiming that they were diseased. Dismayed at this turn of events, representatives of the shippers decided to consult a noted authority on animal diseases. After a thorough inspection, he undertook to put the camels through a rigorous course of health treatment. Each was placed in a specially constructed fumigating apparatus, resembling a furnace, in order to kill any skin parasites present. The long neck of the camel protruded through an opening in the chamber, and was enveloped in a gas-tight canvas sack, to which the fumigating gas also had access. Some of the camels required dental treatment, and were trussed up to permit a dentist to work on their teeth. An entire week was consumed in treating all the animals. At the end of this time they were pronounced to be in perfect shape, and a health certificate was issued.

LENS LOOKS INTO HEART WHILE IT IS BEATING

Looking inside the human heart without halting its beating, has been made possible with a surgical instrument known as the cardiscope. It is a metal tube, about the size of a pocket flashlight, one end of which carries a lens. A small electric-light bulb, fitted on a carrier, is placed against the surface of the lens. This illuminates the inner lining of the heart during an operation after a small opening has been made by the surgeon. By its use it is hoped to be able to cure common heart diseases.

ELECTRIC LIGHTS ON MAP MARK CITY'S GROWTH

Studded with small electric lights, a map, used during a recent exhibit in miniature of many of New York's attractive sights, showed the progress of the city's growth. Mechanics spent many weeks on the wiring and placing of bulbs in order to make every detail of the work accurate, and were rewarded by having one of the most popular displays at the exhibit. A model of the Williamsburg Bridge, complete in all its parts, also was built for the show.



Workmen Putting Finishing Touches on Illuminated Map Designed to Show Growth of City

Model of Great Bridge, Complete in Every Detail, Built for City's Jubilee Exposition

SCIENCE IN TRAFFIC RULES EXPLAINS RIGHT TURN

Why the order in traffic is to keep to the right has been explained by scientists as due to the fact that most people are right-handed and thus, because the right half of the body is kept a little forward in walking, it is natural to swing in that direction. So, turning to the left, as is the rule in many cities of Europe, is not the best way, it is reasoned. In fog, it has been found, a man is likely to walk to the right.

MECHANICAL-DOLL SHOWS REVIVED IN EUROPE

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Operators, Concealed above the Stage, Controlling Wires That Cause Dolls to "Act" in Marionette Show

Mechanical-doll shows, similar to the "Punch and Judy" exhibitions of a generation ago, have been revived in Europe and are attracting a good following among the theatergoers of England and Italy. Known as "marionettes," these dolls are constructed in life-size and clothed to suit the production in which they are used. Wires, attached to the various joints of each doll, are controlled by operators, who are concealed above the stage. During the Middle Ages doll shows were staged by magicians, but their popularity gradually waned until in late years they were practically unknown. Whether the exhibitions will reach this country depends upon the reception they get in Europe.

HOLDER FOR HOT PANS PREVENTS BURNING

Cooks who fear their hands will be burned in lifting hot pots and pans now are offered a safety device for handling dishes. Into narrow strips on both sides and near the top of a pan are placed holders with wooden grips. These serve as handles.

TWO-STORY HOUSE IS MOVED ACROSS 20-FOOT CAÑON

How to get a large two-story house across a cañonlike street, 20 feet deep, was the problem of house movers in San Pedro, Calif., recently. The street is a much-traveled boulevard and the moving operations had to be carried out with extreme caution. It required two days, the pulling being done by two mules with wire cables. A single false move would have toppled the house into the street, endangering the lives of passers-by.

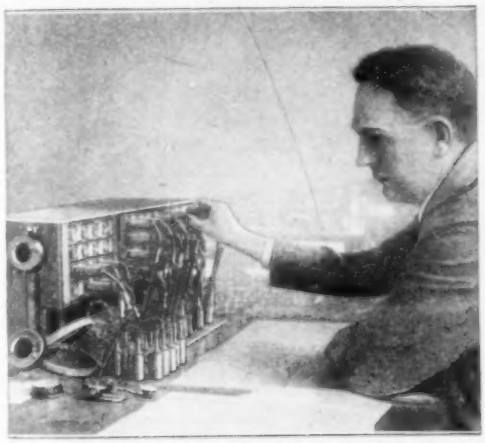
Left: View of Two-Story House being Moved across 20-Foot Cañonlike Street, Showing Arrangement of Cribs. Right: Safely Across; Movers Bridged the Gap in Two Days without Hindering Traffic

BABY CARRIAGE IS TURNED INTO ROCKER OR CRIB

Turning a baby carriage into a crib or a rocker by a flip of the handle is the feat accomplished by a Virginia inventor. With a frame in the form of a rocker, with wheels which may be raised or lowered, it can be used to rock a baby to sleep, or as a carriage, by the movement of a single lever.

NAVAL RADIO IS CONTROLLED BY PHONE SWITCHBOARD

Using a switchboard much like that of a telephone operator's, through which different operators may be connected with any one of the several aerials, has aided the naval radio station at Washington to keep in touch with all parts of the world. For instance, an operator using a high aerial in sending to some distant point, may be switched to one with a smaller range when talking to a near-by station. This wireless station sends and receives messages to and from many European



Switchboard Used by Naval Radio Operators to "Plug In" on Different Aerials

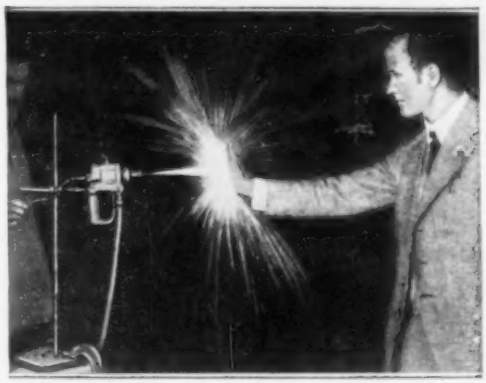
countries, and handles government messages as well to United States warships, in whatever waters they may be.

LEAKPROOF FLOWER BASKET

Moss-covered hanging baskets for plants or flowers are watered at the bottom through a small spout on the side, thus preventing leaking. The water fills a small pan at the base of the flowerpot. This is absorbed by the flowers. A large-mesh wire screening outside the basket holds the moss in place.

SPRAY OF MOLTEN IRON WON'T BURN HAND

Not so many generations ago suspected criminals were forced to walk across a bed of hot coals in what was known as



Spray of Molten Iron So Fine It will Not Burn When Turned against Hand

a "trial by ordeal." It was contended that if Providence prevented their being burned, they must be innocent. To walk across blazing coals seems impossible, and yet recently a European inventor plunged his hand in a stream of molten iron without even being burned. Forced from a nozzle by air pressure, the white-hot metal was broken up into such small particles that it struck the flesh, cooled and fell away like dust, so rapidly that no injury resulted. When spraying from the nozzle, however, it looked like a small piece of fireworks.

SHOOTS HOLES IN STACK TO KEEP CITY LIGHTED

When a storm bent a smokestack in a middle-western city recently, it became necessary at once to find some outlet for the smoke until the hanging part of the stack could be removed. To maintain the city lighting plant, use of this lone chimney for three boilers was imperative, so the top was riddled with holes with a shotgun. Smoke passed through these; a draft was created; the boilers continued to work, and the problem of keeping up electric current was solved. The man who used the gun got the idea from a custom of sending cannon balls through tanks of burning oil. His quick adaptation of this idea to the emergency he faced undoubtedly prevented the shutting down of many of the city's industries for several days.

MACHINE-MADE HORSESHOES IN OLD SMITHY

Horseshoes are now made in a gas-heated apparatus that produces 60 per hour. The old hand rate was about nine

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Machine That Turns Out as Many Horseshoes in an Hour as 12 Men

per hour for two men. The romantic clang of the smithy's hammer will soon be heard no more. The blacksmith of the future will not have the same need for large and sinewy hands. Science is replacing muscle with this invention of a European blacksmith that does many times the work of a smith and his assistant. One of the few uses for the muscular arm now is in swinging a mallet to punch holes in the shoes. The device is being improved rapidly, and soon there may be no more sparks from the familiar old anvil.

HOLLOW HAMMER HANDLE HOLDS SCREWDRIVERS

Three tools are placed within the handle of a steel hammer made by a middle-western manufacturer. A large screwdriver reaches from the head of the hammer to the end of the handle. Inside this screwdriver is another, and inside the hollow handle of that is a third. The hammer has both a flat and a rounded head.

LINCOLN AND GRANT BUSTS PUT IN HALL OF FAME

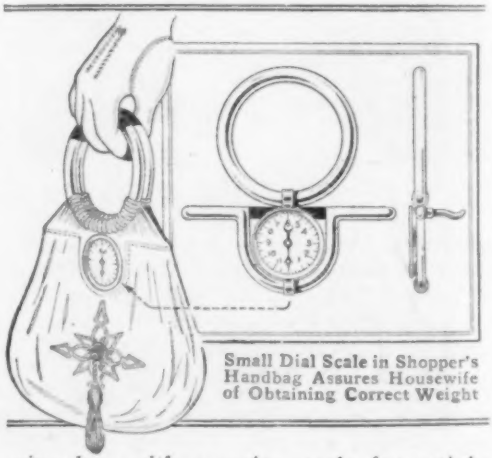
As they worked during their lives, so the busts of Abraham Lincoln and his victorious general, Ulysses S. Grant, have been placed together in the Hall of Fame of New York University. There, in cold marble, they face each other as they did so often during the critical days of the Civil War. With the likenesses of several other noted Americans, these busts were unveiled recently before a gathering of famous persons. A granddaughter of the martyred president was among those present.

POTATO GRATER ALSO SLICES BY CHANGING A TIN

Scratching of hands and slow work in grating or slicing potatoes are done away with by use of a new safety grater that can be used for both kinds of work. A small slicing tin is put in place of a grating tin to change the operation. Potatoes are put in a box with a bottom, that can be changed for slicing or grating, and a small block which is used by hand is also changed. Thus two kitchen utensils are made of one.

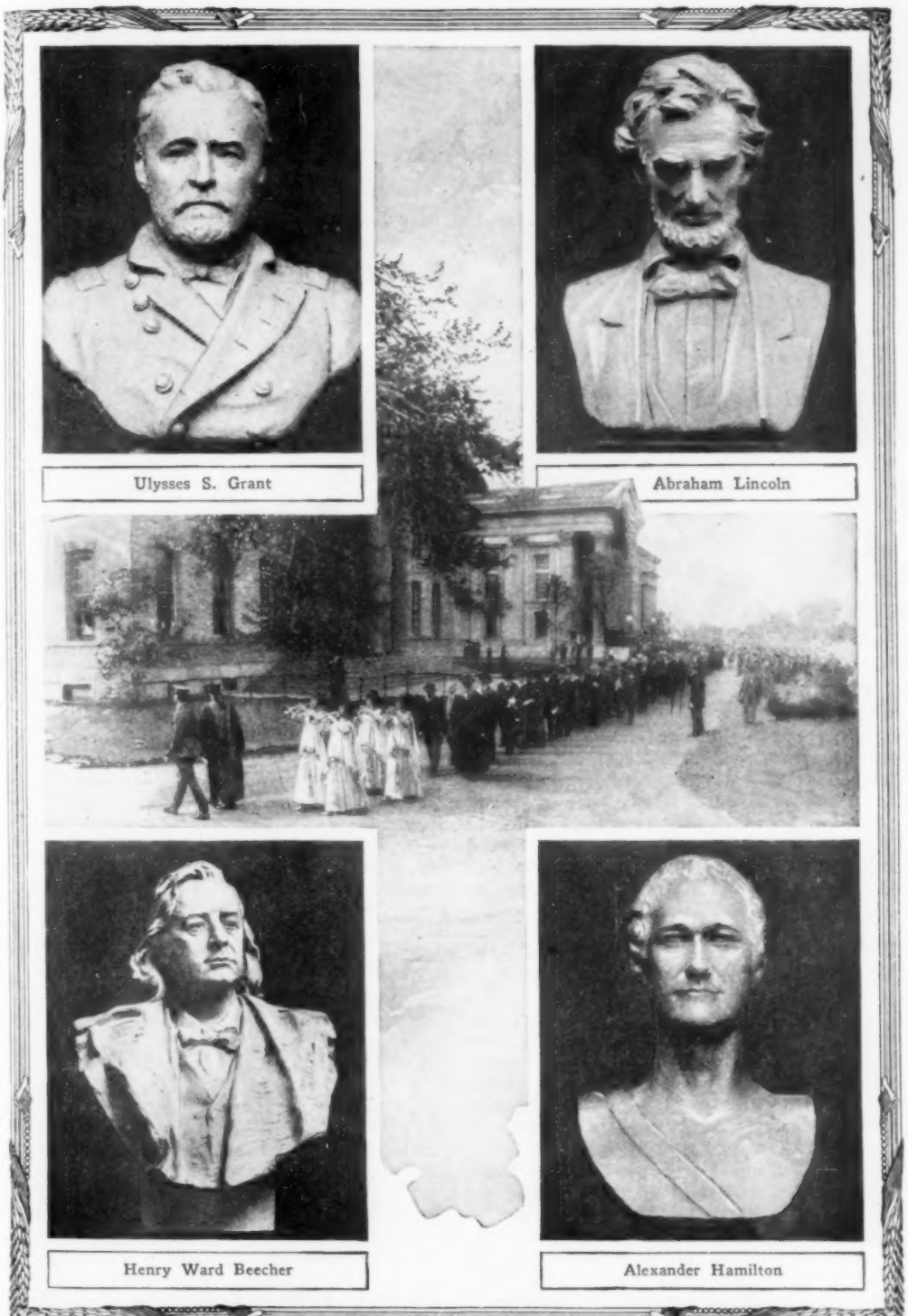
SHOPPING BAG HAS SCALE TO WEIGH CONTENTS

Thrifty housewives no longer have to rely on the accuracy of merchants' scales, since the invention of a hand or shop-



Small Dial Scale in Shopper's Handbag Assures Housewife of Obtaining Correct Weight

ping bag with a spring scale for weighing the contents. The dial is not large and is attached to the handle of the bag, which is made of leather or cloth, as the owner may desire.



Portrait Busts of Noted Americans Unveiled Recently at the Hall of Fame, New York University, and Procession of Notable Guests Who Took Part in Ceremony

LENS ON SUNDIAL SHOWS WONDERS OF NATURE

View of Moon through Garden Lens

Beauty of Flower and Insect World Made Visible

Dial on Pedestal Also Tells the Time

To do for the eye what the phonograph and the radio do for the ear, a movable telescope attached to a sundial has been devised for gardens. Through its strong lens, always ready for use either day or night without adjustment, may be viewed an approaching airplane, a sparrow fleeing from a hawk, or any of the nearly invisible wonders of nature. It requires no care or shelter. With the sundial attached to its base, the exact time is available on clear days. As the instrument is protected by a weather-proof cap, it may be made a permanent fixture in the garden or it may be detached easily and taken into the house. Besides being used for viewing near-by objects, the lens is strong enough to watch the movements of the moon, stars, and planets.

FREAK WEATHER OF WORLD EXPLAINED BY SCIENCE

Climatic conditions the world over are again attracting attention through the efforts of scientists to determine causes of oddities of the weather. Sun spots and the late breaking up of the ice floes have been given as possible explanations of the unusually cool spring. Reports show that similar conditions have been noticed on nearly all the continents.

Although weather is discussed probably more than any other subject, few persons realize that oceanic currents, mountain barriers, and atmospheric conditions may bring almost unbelievable climatic changes that violate all the accepted rules of geography. These factors make frosty blasts in the tropics, a climate in the Far North that is much warmer than sections several hundreds of miles south, and cause conditions changing what normally is the hottest and driest part of the earth, into one of the wettest places in the world.

For instance, in the Congo is found a contrast to the terrific dry heat of the Sahara Desert. Although seldom rising above 85 degrees, the heavy rains create so much humidity that the air becomes a veritable steam. Yet British East Africa, lying in the equatorial zone, with snow-capped mountains, enjoys a healthful climate because of its altitude. Barometric changes bring about the terrific monsoon rains of India, where in the summer Cherra Punji is deluged with 300 inches of rain. Frost is seen sometimes on July mornings in India, but the days are hot.

The Himalaya Mountains form climate barriers that produce varied conditions in certain regions. In northwestern Tibet, August is the warmest month, yet frost can be expected every night. In some sections of Siberia, while temperatures as low as 83 degrees below zero have been recorded, conditions are healthful because it is dry. The Gulf Stream makes some countries warmer than other places many hundreds of miles south. The Alps block air currents in some sections and provide them in others, making climatic changes.

Elevations, oceanic currents, and atmospheric conditions violate some popular beliefs concerning weather in South America, where, for instance, Quito, lying on the equatorial line, has a mean temperature about 20 degrees lower than the west coast of the continent. From day to day here, in different seasons, there is less than one degree change in temperature.

Weather conditions in North America are probably less affected by such conditions than other parts of the world.

TINY HOME IN MATCHBOX IS FEAT OF CARVER

As a novelty for children, tiny figures of people and furniture, whittled so small that an entire room's furnishing can be placed in an ordinary safety-match box, are being sold for charity in Europe. They are called matchbox homes. Each box contains a complete room. In a kitchen, for example, are placed a man and his wife, the woman churning butter, the man sitting at a table eating, and a dog lying at the fireplace. The little models, made of wood and cut with a jackknife, are less than half an inch high.

¶In the past year Canada has exported fresh lobsters valued at nearly $1,500,000 to the United States.

SLEEPING PORCH IN TREE HAS WINDING STAIR

Like the South Sea islanders who built their homes in trees, an eastern man has constructed for himself a sleeping porch

Sleeping Porch Built in Tree is Reached by a Circular Stairway beside the Trunk

elevated about 10 feet above the ground. Entrance is obtained by a winding stairway decorated with strips of sapling. Practically the only modern touches to the place are glass windows and the tin roof and sides. Heavy trees protect it from the wind. Presenting a novel appearance, the house has attracted much attention, although in the summer it is almost hidden from view by the surrounding shrubbery. A heavy lock on the door, however, gives security to the occupant at night.

FIVE-IN-ONE WRINGER MOP KEEPS HANDS CLEAN

Combining the advantages of mop stick, mop cloth, scrub brush, floor scraper, and mop wringer in one device, is the feat of an eastern manufacturer. Between the stick and the scrub brush a roller with a handle has been fitted. This carries a short belt of endless fabric. When used as a mop the cloth covers the bristles of the brush. In wringing it out, all that is needed is a turn of the handle. Thus one mop stick does the labor for which once five separate pieces were needed, and the user does not soil the hands.

"SHAVES" FACE OF CLIFF FIFTY TONS AN HOUR

To cut a rock composed of clay and mud and called shale, which is used to make brick, there has been built in a middle-western city a huge machine that scrapes 50 tons per hour from the face of a cliff. Almost 100 feet high, it is said to be the largest machine in the world used for this purpose. It also loads small cars that carry the material to brick plants. The Indians long years ago cut shale from cliffs and ground it into a clay for pottery making. The rock splits like a shell, peeling off in layers. Rain and frost and snow will break up a deposit gradually but nature is not rapid enough for brickmakers who scoop up in one hour with this giant machine what natural forces would take years to do. Finely grained and uniform shale turns into slate after centuries under an enormous weight. Most shale cliffs are not steep but slope gradually backward from the base because of years of breaking up in rainy, cold weather. In time, shale changes into sandstone. This turns to limestone, next to ironstone, and lastly into coal. But man cannot wait for nature, and hence the invention of the shaver that cuts off enough shale in an hour to make bricks for a large apartment building. The city dweller does not realize that in the brick in his home there are fossil plants that were buried in shale many thousands of years.

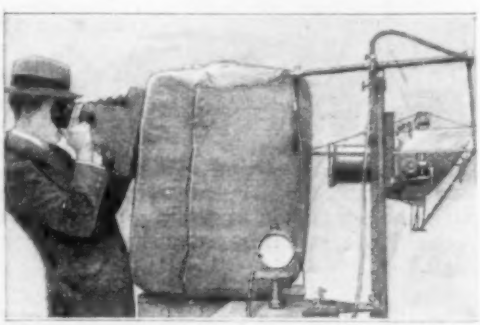
Tower for Scraping 50 Tons of Shale an Hour from Face of Cliff

FIVE DISHES FROM THREE IN NEW KITCHEN SET

Three pans, because of a new type of flange, now are made to serve for five kitchen utensils. They are three sizes of deep pans, the smaller fitting into the larger by the flange on the rim. By turning a pan upside down and placing it on a larger one, a cereal cooker is made. In a similar way, a double roaster can be devised from two pans.

X-RAY BALKS SMUGGLERS' USE OF HUGE BALES

By enabling customs inspectors to see through heavy bales and boxes, an X-ray machine recently put into use in England has proved a terror to smugglers. It also has resulted in a great saving of time, as it makes it needless to unpack heavy shipments in search of suspected contraband, such as liquor, being shipped to the United States. The machine is light and may easily be carried around the docks by one man. So quick is its action, that it will do the work of many men.



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X-Ray Machine being Used to Look into Bale Suspected of Containing Contraband

Fighting Fire on the Right-of-Way

WITH thousands of lives and untold millions of dollars depending upon the keeping open of the great transcontinental arteries of travel and commerce, western railways maintain fully equipped fire departments to guard against destruction of their snowsheds over the mountains.

One road alone keeps four trains with steam up, ready for instant action at any hour of the day or night. Every device known to science is used to protect its 7,000 miles of track. Located at strategic points, these railway fire fighters keep ceaseless vigil over the lives and property entrusted to their care.

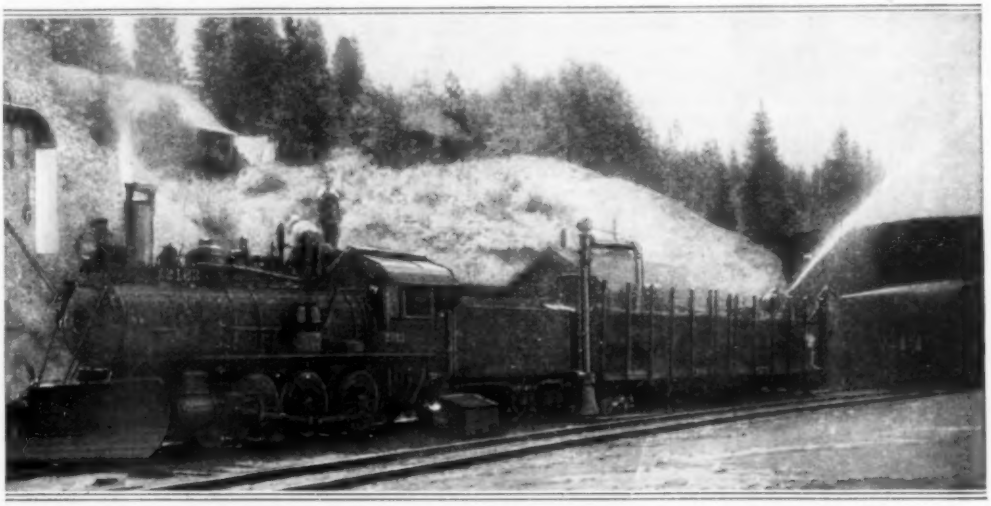
From vantage points in high towers, men with telescopes, field glasses, charts, and other scientific aids, scan the surrounding wilderness for the first gray puff of smoke which may herald disaster. One such tower is located on a mountain 7,860 feet above the sea level. From its windows are visible scores of miles of twisting rails protected by the snowsheds.

When the surrounding forest timber becomes dry the danger is greatest. Fires so small that at the beginning they seem mere puffs of smoke, spread with lightninglike rapidity until miles of territory are covered by a roaring sea of flames that devours everything in its path.

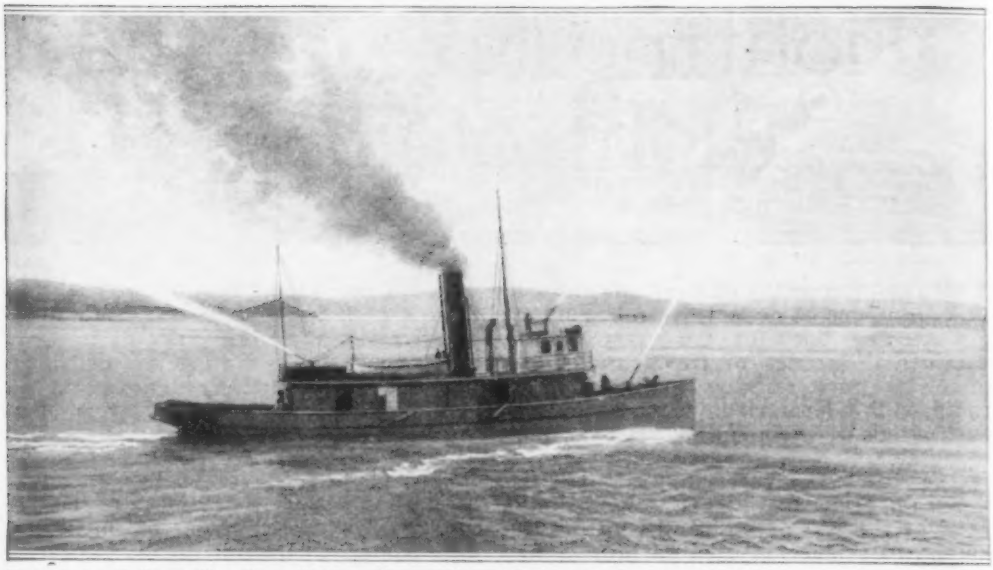
In fighting such a fire, water is often not to be found and so is carried in great 25,000-gallon tanks on the trains, which can be made ready to answer an alarm in three minutes. Besides the trains, fire tugs are used to guard the terminals and their contents. Hose is carried on switch engines which are provided with water sprinklers.

Owing to the vigilance of these fire fighters and the completeness of their equipment, not a single case of serious damage by fire has been reported on one great railway system in the past year.

This road has fire chiefs, fire brigades, and fire companies. Its equipment includes a fire boat on San Francisco Bay, and several trains. In addition, fire hazards are reduced by burning the old lumber from shed repairs, brush, and other rubbish during the winter months when fire will not spread. Every nook and corner inside the sheds is combed for



Fire Train Fighting Flames Which Threaten Snowsheds Thousands of Feet above the Sea Level and Block Traffic: Four Such Trains are Kept Ready to Guard Miles of Track



One of the Railway Fire Tugs Used to Protect Terminals in Western Metropolis and Their Contents, Which are Often Valued at Untold Millions of Dollars

every unnecessary inflammable article and when found it is destroyed or disposed of.

With watchmen located in the sheds only, as was at one time the case, threatening forest fires could obtain considerable headway in the fire-shed district before discovered. Consequently search was made for a point which would give a bird's-eye view of the snowshed district. This point was found on the top of Red Mountain. Here a stone observatory was located, four miles from Cisco, Utah, and from this point watchmen, during the season of fire danger, keep a 24-hour vigil with telescope and charts, supplemented by field glasses.

The watchman's telescope is located in a bay window and has a range of 180 degrees, or a half circle. To the telescope is fastened a pointer which travels over a circular chart placed in the front of the telescope. On this chart are located the milepost stations and other well established points in their relation to the sheds. On the window is a black line, the exact reproduction of the line of sheds.

When the watchman discovers smoke or sees a fire, he looks through his telescope and if the cross hair in it is on the line on the window and fire at the same time, he knows the blaze is in the sheds and with the aid of the pointer and chart determines the nearest point established on it. This information is telephoned to the telegraph operator at Cisco. The watchman can tell if the fire is above or below the sheds and even if the fire is not in the sheds, if it is anywhere in their vicinity, men are sent to investigate and prevent the flames from approaching nearer to the railroad property.

In addition to the watchman service just described there is an electric fire-alarm system with 42 fire boxes.

Hut on Lonesome Mountain Peak Where Watchers Keep Ceaseless Vigil over the Surrounding Territory to Report Fires So Small That at the Beginning They Appear as Puffs of Smoke

PICTURE MIND IN ACTION WITHOUT A CAMERA

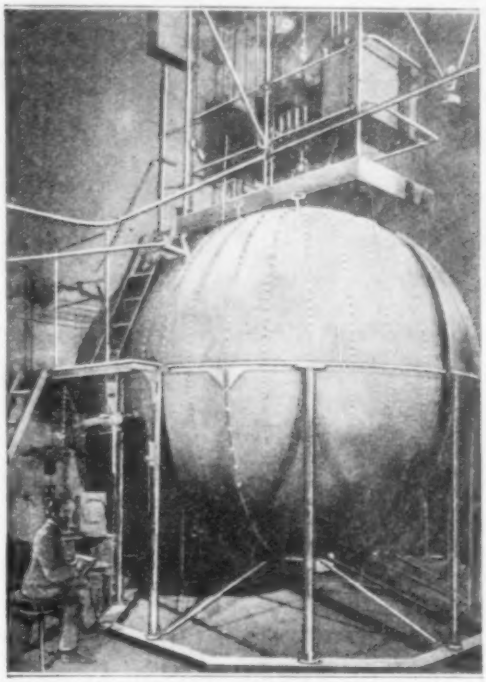
Photographs of thoughts are being made by a western research society, it is claimed. Objects upon which the subject thinks deeply for 10 minutes appear upon a film wrapped in a black paper, sealed in a yellow envelope, and hung 12 inches before the eyes. No camera is used. Persons holding strips of film to the forehead for 10 or 15 minutes obtain pictures of the objects or scenes upon which they concentrate, according to the scientists. In one test, recently made in the presence of several persons, a man wrote on paper the thing upon which he would think. He drew a rough sketch of the object and studied this five minutes. Then it was laid aside and he concentrated for 10 minutes on the photo plate suspended 12 inches from his eyes. He did not touch the plate, which was taken by three men to a dark room and there developed. A cross appeared. The paper written by the subject was next found to read, "I will think of a cross." This test has been repeated several times with success, the society reports.

COFFEEPOT FOR CAMPERS WON'T BURN HANDS

To aid campers, a coffeepot, intended to overcome some of the troublesome features of the ordinary one, has been invented. With this utensil the hands cannot be burned because the handle, although folded when the pot is packed, is locked into position when in use. Another trouble with the usual camper's coffeepot is that the spout and handle sometimes melt off when used on an open fire. This is not possible with the new type because the spout and sides of the pot are made of the same sheet of metal. The side walls are springy enough so the cover can be placed inside to aid carrying it. When the pot is tilted, the cover cannot fall off.

GIGANTIC GLOBE IS BUILT TO MEASURE LIGHT

For measuring the intensity of light, a European scientist has built a huge globe. This, he claims, is more accurate than the former method where only a disk of paper was used. In practice, it was found that the lights used did not shine as brightly or strongly in all directions. Therefore, to measure the light of a candle or lamp, it was necessary, under the old system, to take measurements in various directions. To avoid this loss of time, the sphere was devised, the light being placed in its center. As the walls are painted white, the reflection of the light is given back from every direction, and to obtain its intensity only a single measurement through a small window is needed.



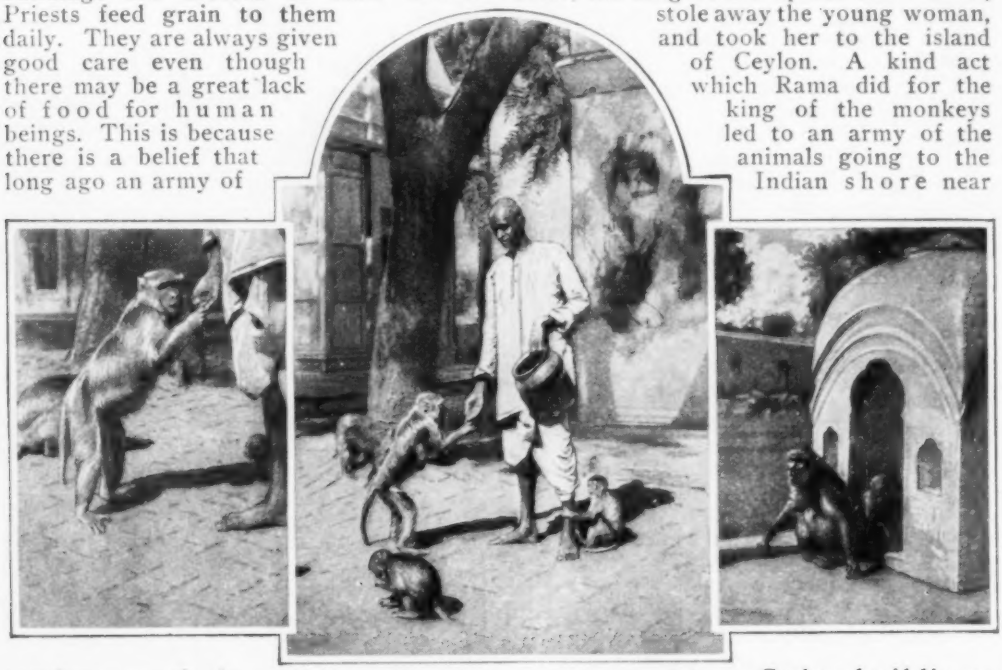
Huge Globe and Platform That Enable Scientists to Measure Intensity of Light

METAL WREATHS FOR GRAVE

Metal floral wreaths for graves will keep shape and color even when exposed to bad weather for many years. They are in various shapes, sizes, and material. Clever workers with tin make some models that are excellent likenesses of real flowers.

WORSHIP MONKEY IN INDIA AS FRIEND OF MAN

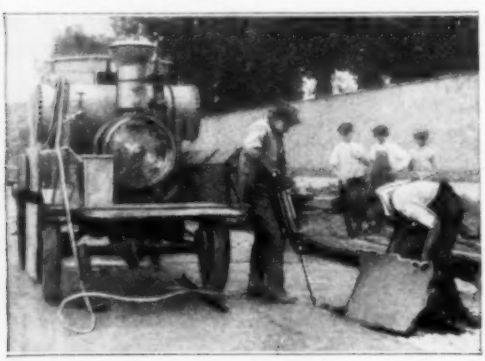
Monkeys are worshiped as gods in hundreds of temples in India. Great buildings are erected in their honor. Priests feed grain to them daily. They are always given good care even though there may be a great lack of food for human beings. This is because there is a belief that long ago an army of monkeys saved the life of Sita, bride of Rama, who was the hero of the great Hindu story of the gods, "The Ramayana." The Indian idea is that when Rama was roaming in the woods with his bride, the king of evil spirits came down, stole away the young woman, and took her to the island of Ceylon. A kind act which Rama did for the king of the monkeys led to an army of the animals going to the Indian shore near Ceylon, building a bridge of stones, crossing over, giving battle to the evil spirits, and restoring his bride to him.



Monkeys in India Fed and Housed by Priests Who Worship Them as Gods

AIR STRONGER THAN BRAWN IN BREAKING CONCRETE

Back-breaking hand-sledging days of the gas man and street repairer are passing with the introduction of a new labor-saving device. By using an air compressor on an automobile truck, concrete-breaking hammers have been applied to opening streets and even basement walls. Three such hammers, it is estimated, can do in from 30 to 40 minutes what formerly took four men over four hours to accomplish. In use, the hammers cut away the asphalt or concrete in large slabs and then pound their way through the base to the earth.



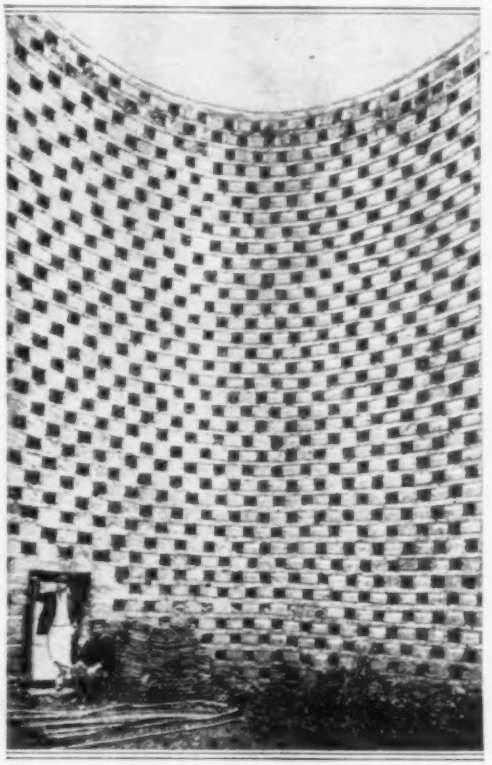
Air Hammer Doing the Work of Several Men in Opening Pavement for Street Repairs

TOOL OPENS ANY-SIZE CAN, BOTTLE, OR FRUIT JAR

Any-size can, fruit jar, jelly glass, or bottle can be opened with a self-adjusting wrench recently put on the market. No moving of parts to fit various sizes are needed. The opener is so designed that all the housewife does is to grasp the handles, and the notched edges of the opener will fit into position at once. There are no sharp points or edges, and the grip is so firm that a child can use it.

OLD FRENCH PIGEON HOUSE LOOKS LIKE A FORT

Homes for more than 5,000 pigeons are contained in a unique birdhouse at the ancient Tocqueville Château in France. Solidly built of stone blocks, it has defied the passing years, and for decades has been the home of great flocks of winged messengers of the skies. During war times it supplied birds for army use in great numbers. In appearance it is like a fort or checkerboard, its odd design resulting from an effort to give its inhabitants plenty of light and air. Although all of the thousands of separate openings look exactly alike, their feathery occupants experience no difficulty in picking out their own niches from what, to the human eye, looks like a bewildering maze. At feeding time, the air is fairly filled with the rustle of wings as the birds flutter about the head of their caretaker.



Birdhouse in France in Which Thousands of Pigeons Make Their Homes

SIX CHANGES IN ELECTRIC LIGHT REDUCE COST

Six changes, from full to out, are provided by an electric-light socket that operates by the pulling of a chain. By turning it up or down, the light serves as a "nite-lite" after retiring, gives a subdued glow for reading, or a full glare when required. Its use is said to result in a saving of from 30 to 80 per cent in current.

How Electric Light may be Turned Up or Down at Pull on Chain

RADIO SECRECY IS GAINED BY "SCRAMBLING" WORDS

Radio messages can now be sent which may be understood only by the person for whom they are intended. This is the result of an apparatus to distort, or "scramble," the words which are received on a special "set" designed to decode them. Heretofore, one of the greatest objections to the commercial use of the wireless has been the difficulty of guarding messages from eavesdroppers. Privacy in radio conversations is declared to have been assured by the new method. While it is not claimed that it is absolutely secret, it is said that messages sent by this system can be deciphered only by means of special apparatus not at the command of the ordinary amateur. Recent tests over a 30-mile stretch of water between the west coast and Catalina Island, are said to have been entirely satisfactory. The method was developed partly as a result of the post-war scarcity of cables for underseas use.

BOAT PADDLE WHEELS ACT LIKE OARS ON RIVER

Designed to navigate crooked streams at full speed, a boat with two paddle wheels that act like oars so they do not lift the water, has been tested in the South. It is claimed that this results in a saving in fuel by allowing the water to run from under the vessel naturally instead of having it drawn up by the wheels which operate at an angle of 60 degrees from horizontal. Each wheel is run by a crude-oil engine. Easier steering is said to result, making the craft of special value in navigating shallow and winding rivers.

Down but Defiant, Huge Moose Threatens Its Enemies with a Feeble Toss of Its Antlers

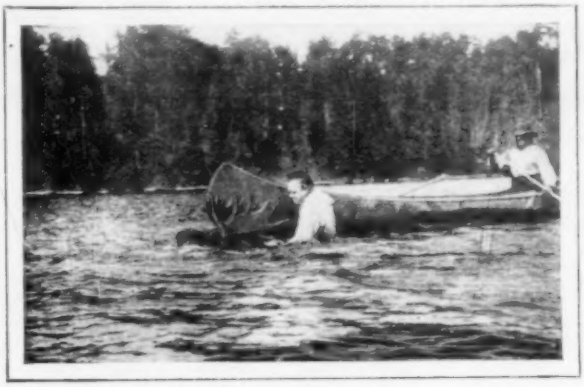
Long after Trip is Over This Prize Head will Serve the Hunter as a Reminder

IN QUEST OF THE LORDLY MOOSE

WITH the approach of fall thousands of sportsmen, who for 11 months of the year remain chained to office desks caught in the trammels of modern city life, are preparing to turn their backs upon civilization, adopt the up-to-date version of primitive life, and hie themselves back into the wilderness of the great North.

From the little log cabin on the shore of that pine-rimmed lake comes an irresistible "call of the wild," for the northern woods have a subtle magic all their own, and seldom relinquish their hold upon any man, once they have placed their lure upon him.

While the whole United States can boast only about 7,000 moose, the wilderness country of Canada is the native home of hundreds of thousands. In many sections, in all its essential features the forest fastness is today the same as it was in the dawn of history. For the "toter" of rod and gun, no rarer land exists. Here nature has left a vast sanctuary untouched by civilization's finger.



Riding a Swimming Moose: The Hunter Leaps to Its Back from the Canoe

There is good moose hunting in practically every province of Canada, and, roughly, about 10,000 moose are killed each year. Of these it has been estimated that half are killed by visitors from the States, which, by way of comparison, is almost equal to the mature moose herd of the entire United States.

Although this may seem a heavy slaughter, yet far from being a danger of exhaustion to the herds, authorities of various hunting grounds advise that a killing of twice this extent might be made each year and the natural increase definitely offset any tendency to the extinction of the monarch of the Canadian fastnesses.

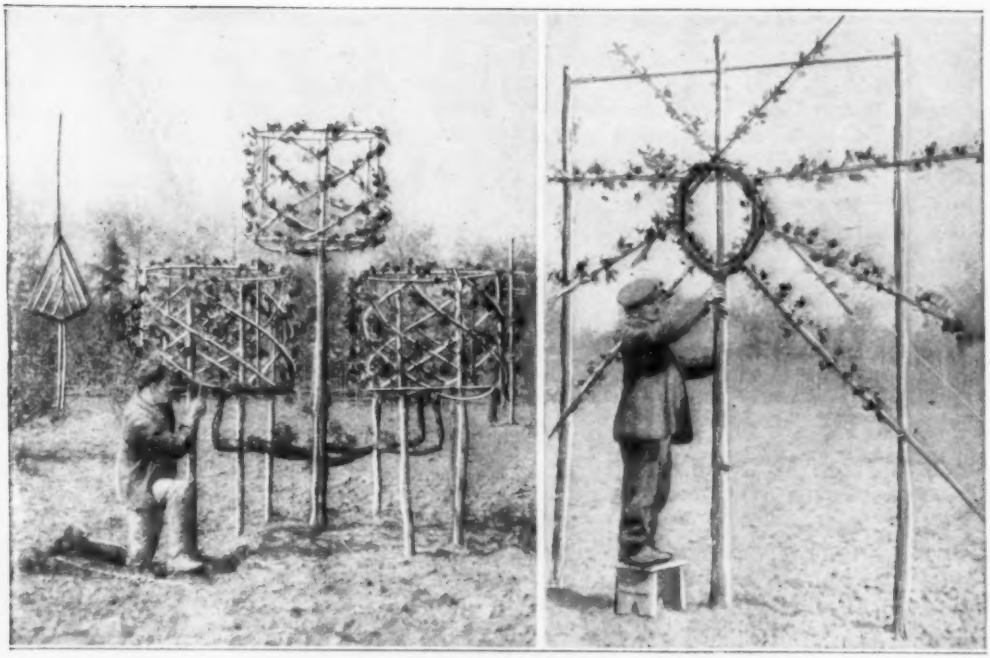
By the middle of August the migration to the North is well on. At this season, and more truly so in early September, the hardwood ridges are a riot of color. The yellow of birch and alder is relieved here and there by the deep, rich green of pine, spruce, and balsam, plentifully dotted with the vivid red of the frost-crimsoned maples.

The lordly moose can be heard bellowing his hoarse challenge far and wide. The most exciting, though perhaps not the most sportsmanly method of hunting, can now be practiced, and the thrills experienced in listening to a moose coming to the call last long after the kill has been made.

Paddling quietly to some prearranged spot, just before sunset, keeping well in the long shadows, the guide moistens his lips and, raising the birch-bark horn, he sends forth the low guttural "Ooh-aah-uh," "Ooh-aah-uh"—seductive call of the cow—quietly at first, as some old bull may lurk in a near-by thicket, in which case he would be likely to notice the deception, and crash off through the bush, spreading the alarm for miles. The call echoes through the forest stillness, and two minutes are then spent in straining to catch the faintest reply.

Minutes pass — and then comes a strange sound, not unlike the distant bark of a dog. The guide creeps up quietly and whispers with suppressed eagerness: "Bull moose—him come." All is quiet, and it is nearly dark. The Indian, figuring the length of time it took the bull to reply, waits just that long before giving another call. This time it is answered sooner, and the direction of the approaching bull can now be ascertained by the occasional snapping of a branch, and when he stops, now and then, to thrash some unoffending bush noisily with his antlers.

Two hours pass and the moon is peeping over that balsam on the point, silhouetting its outline in bold relief against a silver background. The guide calls low and a quick answer comes from the moose. Standing full in the light of the moon, the animal offers a splendid target, and the first shot brings him down.



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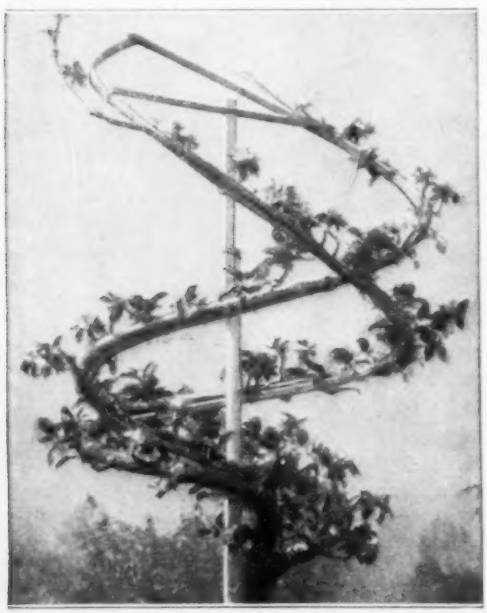
French Orchard Owner Training Limbs of Young Fruit Trees to Grow in the Form of Baskets and Circles without Cutting Down Fruit Yield

FRUIT TREES ARE TRAINED IN MANY QUEER SHAPES

To satisfy a love of beauty, weird effects, and a keen sense of efficiency, a French orchard owner has trained his trees to grow in strange shapes without affecting their yield of fruit. By striving tirelessly for years, he has made the limbs assume the form of spirals, corkscrews, perfect circles, strange baskets, heart-shaped pyramids, and inverted cones. Taking as his motto the saying that, "As the twig is bent, so the tree is inclined," he has begun with the tender branches, shaping them in the way he desired as they grew. This has not interfered with the blossoms or the yield, although many of the limbs have had to be sustained with props while they were loaded down with fruit. Other trees have been dwarfed until the entire orchard presents a picturesque sight, making the beholder believe that he has wandered into a strange world.



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Tree Limbs being Trained to Curve about a Post

WASTEBASKET IN DESK

To save space in offices a wastebasket which fits into the desk has been invented. It hangs under the desk top in the place where a typewriter is sometimes placed. As it is made of metal, it is fireproof, clean, always out of the way, and cannot be upset. The same type of basket is being made for kitchens, sewing rooms, bathrooms, and the home library. It is easily removed for cleaning.

NEEDLES AND FRYING PANS SIZED BY NUMBERS

Numbers will serve to indicate the sizes of everything from tacks to frying pans under a new system of measurement being worked out by scientists. Many articles now in use are measured as they were when made by hand before machinery became known. Nails were sized by their cost back in the days when made by the smith. They were sold by the hundred and were given a size from the price which was paid for them. A 10-penny nail was called so because its price was 10 pennies per hundred. Under the new way of measuring, a series will start with a certain number, and the number for each larger size will be 60 per cent higher than for the preceding size. Thus, 10 will mean one size, and 16 will stand for the next larger size.

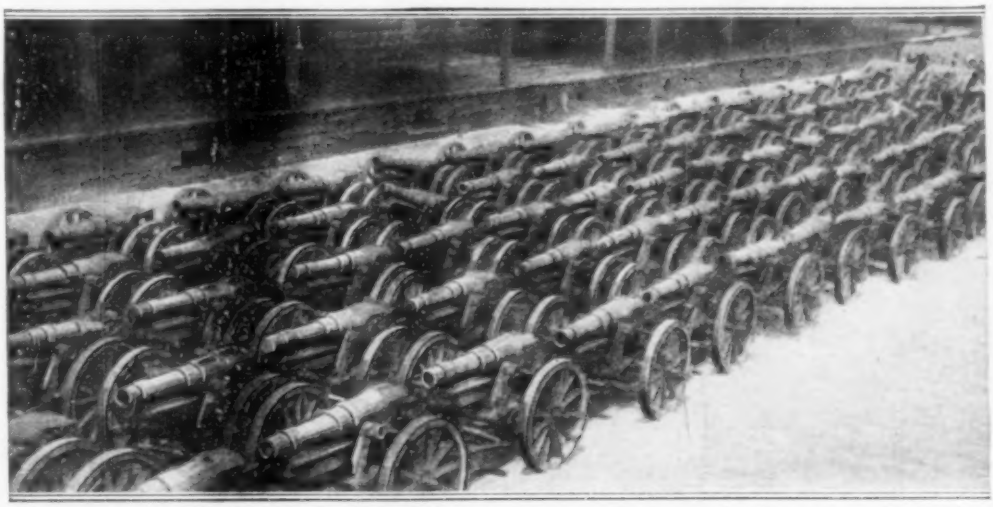
X-RAY LETTERS TO FIND ANY MISSING CHECKS

More than 6,000 letters a day are examined by a middle-western gas company to prevent the loss of any checks or valuable inclosures which may have been overlooked when the envelopes were opened. For this purpose a machine similar to the X-ray has been designed. Before the envelopes are finally destroyed, they are run down a glass-covered tobogganlike slope. Underneath is a powerful light which makes them perfectly transparent, and any inclosure can be detected instantly.

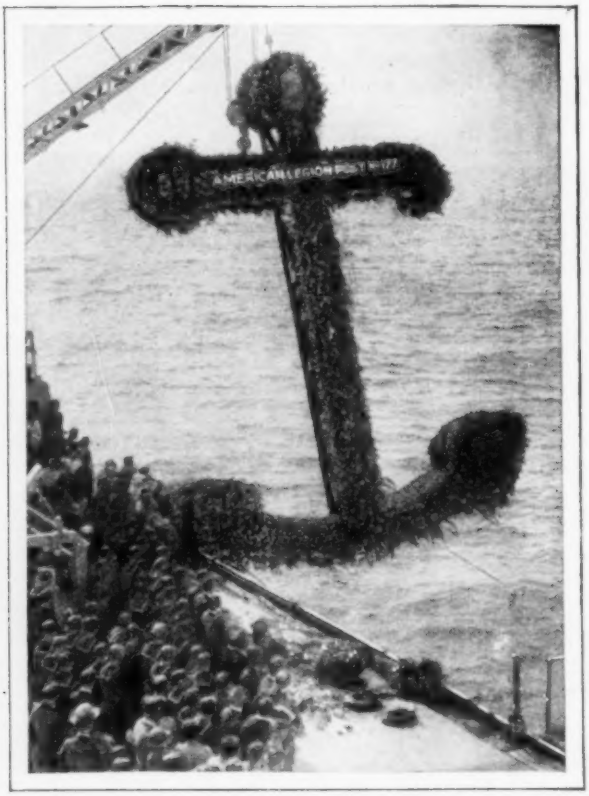
Girl Looking for Money and Checks in Envelopes Passing over Strong Light

THREE MILLION GUNS ON UNCLE SAM'S HANDS

More than 3,000,000 big and little cannons, rifles, machine guns, and other equipment won in the World War are proving a burden to the government. Every attempt to make a wholesale distribution of them to towns and cities throughout the country as war memorials, has met with failure. No one, apparently, wants them, and now that Port Newark, N. J., where they are stored, is to be closed, their disposition has become a problem. It has been suggested that they be taken out to sea and sunk with appropriate ceremonies.



Some of the Cannons Won in the War Which are Proving a Burden to the Government: It has been Proposed That They be Sunk at Sea



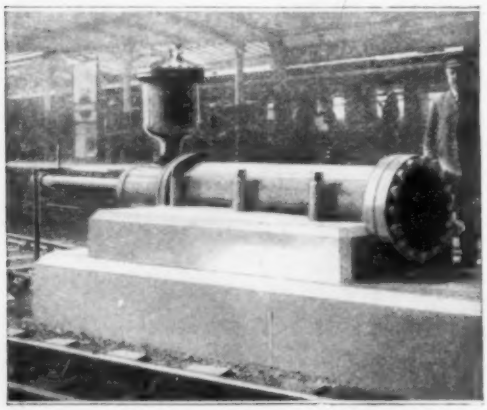
Forty-Foot Anchor Made of Flowers Dipped into Ocean as Tribute to Heroes of the Sea

DIP HUGE FLORAL ANCHOR AS TRIBUTE TO SAILORS

While officers, enlisted men, and civilians stood at attention on the U. S. S. "Nevada," a 40-foot anchor entirely covered with flowers was dipped into the ocean in memory of sailors who died in war. The anchor was lifted from the main deck by a huge crane and gently lowered into the water as a tribute from former soldiers and sailors. While the heavy guns boomed out a requiem and the ship's flags were dipped, members of a veterans' organization and the sailors dropped flowers and floral wreaths over the surface of the sea in memory of their lost comrades. Then the bugles sounded "taps," and the impressive service was ended. Civilians are seldom allowed on board a United States fighting craft, but on this occasion the rule was violated so that both present and former sailors might join in the ceremony, declared to have been one of the most impressive ever seen aboard a warship. After it was over, the ship returned to port with its flags still at halfmast.

WATER BUFFER STOPS TRAIN WITH ALMOST NO JAR

In an underground railroad station in London there has been placed a hydraulic, or water-power, buffer that, although weighing 7½ tons, will stop a pressure of 200 tons. On a recent test this buffer stopped a train running 10 miles an hour at a distance of 9 feet, without much shock to passengers or train. There is an extra-large reservoir of liquid for the giant plunger. Electric cars are used on the railway which is conducting the tests with the bumper. They sometimes have eight or ten coaches to the train, which must be stopped quickly.



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Water Tank and Heavy Plunger Used to Stop Trains in the London Subway

AUTO OPENS FLOODGATES BY TURNING A WHEEL

On floodgates in the West, where 64 turns of the handwheel moved the gate only one inch, a light automobile engine is now being used. The four-cylinder engine and a few cents' worth of gasoline now do the work of several men in moving the five gates weighing two tons each. The engine is put in low speed to raise, and in reverse to lower them.

IRON USED TO FLOAT LOGS OF HEAVY WOOD TO SEA

In logging timber tracts in South America and the West Indian islands, the heavier wood, which is not sufficiently light to float, has always proved difficult to move. One firm recently solved this problem by using "floaters," made of rust-resisting iron, by means of which the heavy timber was rafted down a river to the sea, where it went to a sawmill or was loaded on waiting steamers.

TEACH BABY HOW TO STAND WITH CRIB GUARD

To keep a baby from falling out of the crib or carriage, to teach the child how to stand, to prevent round shoulders, to make strapping needless, and to change the buggy into a bed, are some of the purposes of a new baby guard which has been invented by an eastern father.

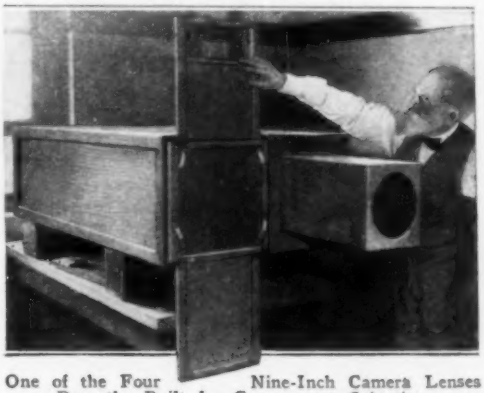
The guards are made of metal and will fit any size buggy. They can be strapped to the buggy and are light and strong. In appearance the device looks merely like a small fence surrounding three sides of the carriage. It resulted from an accident when one of the inventor's children climbed to the edge of a baby buggy and fell to the sidewalk, but without serious injury.

MANY-PURPOSE GOLF CLUB TO SUIT ALL PLAYERS

Golfers are now offered a putter which is adjustable to four positions. It can be used either right or left handed, as the player chooses. A half turn to the left loosens the shaft for setting, and a half turn to the right tightens it again. To adjust the head to any desired face, only a turn of the hand is necessary. It then locks itself in place. It may be used as a putter, midiron, or jigger.

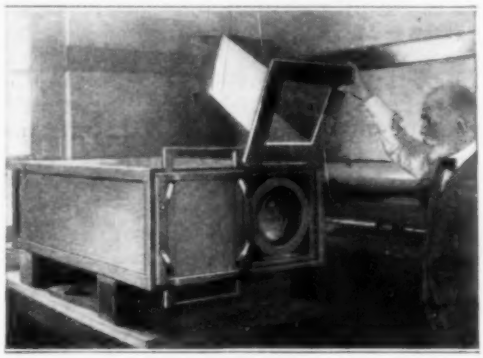
U. S. BUILDS HUGE CAMERA FOR LIFE-SIZE PHOTOS

For the purpose of taking a life-size photograph, a camera as large as a carpenter's tool chest has been devised by



One of the Four Nine-Inch Camera Lenses Recently Built by Government Scientists

government scientists. Six feet long, the box is 4 feet wide and 2½ feet high, and is fitted with four lenses 9 inches in diameter. The chief advantage of the new



Combined Plate Holder and Shutter of Huge Camera for Life-Size Pictures

camera is said to be that the life-size photographs do not have to be retouched, as is the case when enlargements are made. The lens is left wide open when pictures are made. Two cardboard shutters are used.

ALUMINUM STAGE SCENERY IS EASILY ERASED

Aluminum stage scenery is used in Europe, it is reported, in places where wood is costly. The metal sheets are light and easy to move, and the designs on them can be easily erased when new scenes are to be painted.

GUARDING RAIL LINE OVER GREAT SALT LAKE

Where Operators Keep Ceaseless Vigil over the Lives of Untold Thousands of Passengers Who Ride on Trains Crossing Trestle over Great Salt Lake

One of the most important short stretches of steel highway in the country is the railway line across Great Salt Lake in Utah. Although only thirty miles in length, approximately 40,000 passenger trains, carrying something more than 2,250,000 passengers, and 90,000 freight trains or about 4,000,000 cars, have gone safely over the trestle without significant mishap since it was built twenty years ago.

Several acres of piling and other trestle timbers are kept afloat, while a motor boat and a pile driver are always ready for use in case of damage by wind or flood waters to the structure. A train of cars loaded with rock, and another loaded with gravel, are under steam constantly to guard against any interruptions to traffic. Work cars also are provisioned and equipped for emergency use. These are merely safeguards, however, since no such grave emergency has yet arisen.

Extremely low speed is required of all trains on the trestle, since there must be no accident or damage to this most precious part of the transcontinental line. An electric signal is sounded in a central office the moment a train enters or leaves either end of the trestle. No engine may pass the station without permission, and when they are coming too fast the operator blocks the train.

Any sudden stopping of a freight on the trestle gives it a slight writhing motion, and the operators have become seasick. The same thing is true regarding passengers on the through trains.

Looking Toward the East from the Middle of Huge Trestle over Great Salt Lake

WOOD STRIPS SAVE BREAKAGE OF DISHES

To prevent breaking of dishes on the sink, a set of wood strips is being sold. They are placed on the drainboard, the bottom of the sink, and on the side, where a strong support holds them in position. They are made of a soft wood, so there is little danger of smashing china put on them.

ICE FIELDS MAY RETURN, SAY SOME SCIENTISTS

Scientists are viewing with interest the question of whether ice fields will again cover Canada and parts of the United States. Some have said this land now is in a period between visits of glaciers. It is known that there have been ages when ice fields covered this land, drew back, and returned again. This is seen by plants and animals like those of today found in rocks which show the scars made by the ice once present.

ELECTRICITY FOR CAMPERS FROM PORTABLE PLANT

To supply light and power for campers and others, a small, portable power plant has been made which can be run anywhere without building a foundation for it. The generator is operated by a one-cylinder, air-cooled, gasoline motor. Storage batteries give a reserve supply of electricity. It will start or stop at the touch of a button. Besides supplying light, the plant may be used for charging radio storage batteries, operating washing machines, churns, and cooking devices. It requires practically no care except regular quantities of gasoline and oil, and may be run by a child without danger.

COFFEEPOT DRIP STOPPED BY RIM IN SPOUT

Every housewife can tell the story of the frequency with which clean tablecloths are soiled by drops from the spout of a coffeepot. In spite of every care, this is liable to happen with existing pots and pitchers. A German inventor comes forward, however, with a patented spout that prevents the drip from reaching the cloth. A flange catches the drop, as it runs down the spout, and turns it into a small reservoir near the body of the pot. When the coffeepot is again tilted for pouring, another flange leads the drop out over the top of the spout into the coffee being poured.

RECORD-SIZE ELEPHANT TUSKS FROM DARK CONTINENT

What are declared to be the largest elephant tusks seen in recent years were taken from the head of a huge beast killed in the wilds of British East Africa. They weigh about 365 pounds, and tower high above a man's head. Ivory from this section of Africa is specially valuable, and this pair of tusks is valued at $10,000. Mr. and Mrs. Martin Johnson, hunters who spent two years in the African wilderness, are responsible for the catch.

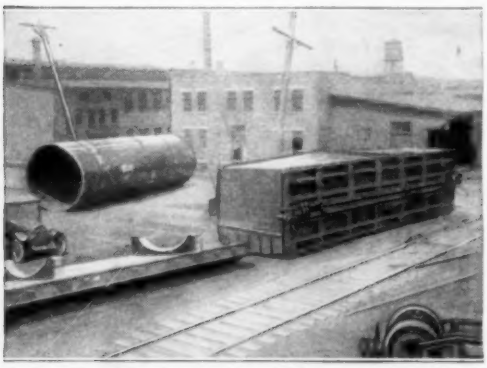
This Ivory Bower, Worth $10,000, Arches over the Head of Mrs. Martin Johnson, African Huntress

GIANT CLOCK HAS LETTERS IN PLACE OF NUMBERS

Of the many thousands of persons who pass it every day, few have noticed that the clock in the tower of the Wrigley Building, in Chicago, has no numerals on its face; nothing but 12 giant "W's" where figures are usually found. Watchmakers say people have become so accustomed to clock faces that all they notice in telling the time is the position of the hands. At a distance, the great letters on the face of the Wrigley clock look like mere black dots, so the average beholder takes it for granted that they represent figures. Closer inspection from the street level, however, reveals the self-deception.

HEAVY DRUM UPSETS TRAIN AS IT ROLLS OFF CAR

When a 50-ton drum rolled off a flat car, while being transported from a Wisconsin factory to the East, it upset the



Havoc Wrought by a 50-Ton Drum, Which Rolled off a Flat Car While Passing through Wisconsin City

train, snapped off a tree and telegraph pole, and damaged other property, before coming to a stop. The drum, which was 12 feet wide and 50 feet long, started on its tour of destruction as the train was going over a smooth stretch of track. Overturning cars smashed the sides of a warehouse and tore up the right of way for some distance.

SQUEAKS TELL STRENGTH OF ANY METAL

Stretching a metal until it squeaks and listening for the sound with a very sensitive telephone device will give a test showing how much strain that metal can stand as a girder in a bridge or a rail in a railroad, according to tests at an eastern university. By this method all forgings may be rapidly tested before they are put into use. Several kinds of metals have been used in the experiments and it was found that squeaking, rasping sounds resulted from the grating of the molecules in the material when its breaking point had almost been reached.

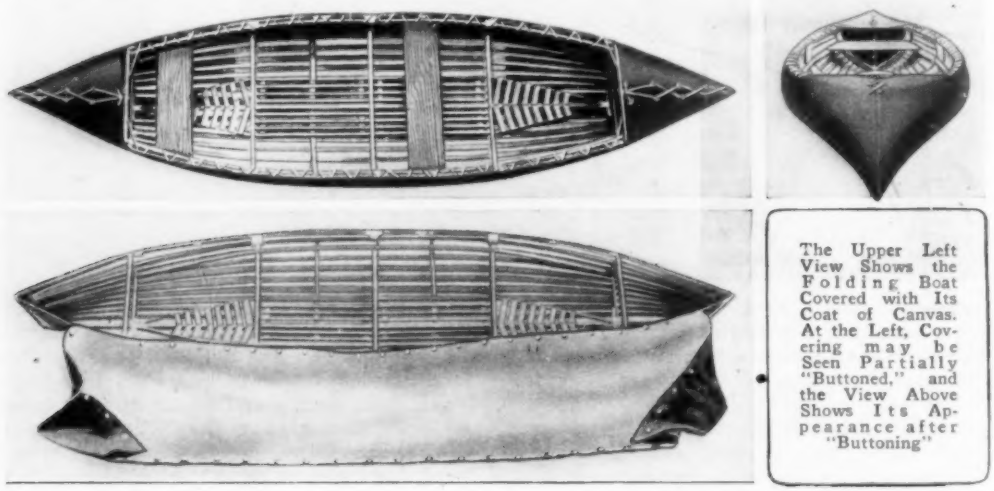
"TOP-O'-THE-WORLD" RACE BARS FREAK CARS

Automobile enthusiasts have hailed with joy the announcement that freak cars are to be barred from the race to the summit of Pikes Peak on Labor Day. No car weighing less than 1,600 pounds, without the driver, may enter the contest.

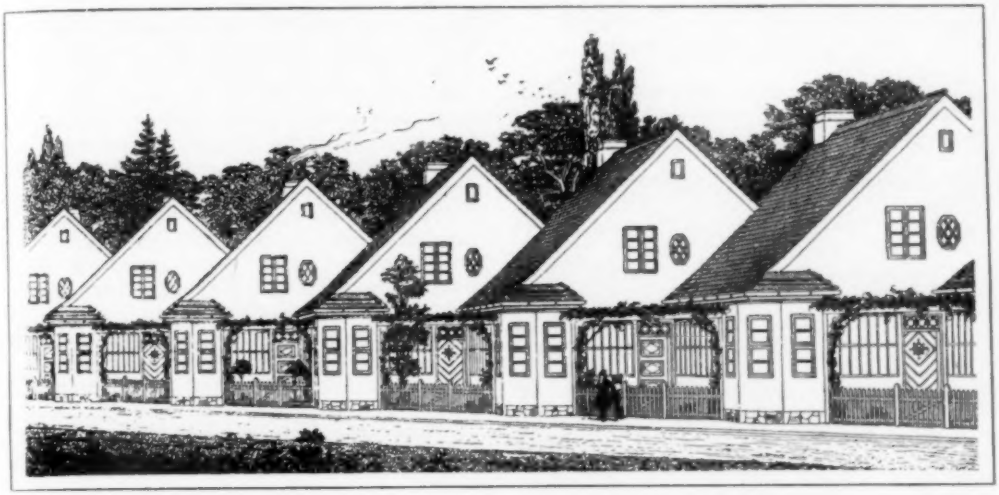
The course to the top of the mountain covers slightly more than 12 miles and is a double-track boulevard from 20 to 50 feet wide.

CLOTH-COVERED FOLDING BOAT SET UP WITHOUT TOOLS

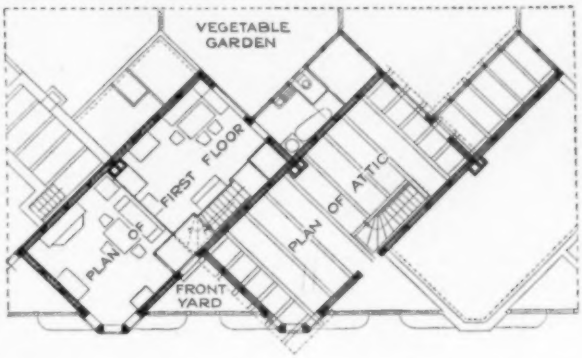
Canvas covering that laces over spruce and aluminum ribs, fitted together without screws or bolts and without the aid of tools, features the construction of a folding rowboat now on the market. It contains no veneer or glued parts to be loosened by moisture. The boat can be quickly put together or taken apart, but will not fold up until the canvas is completely removed. Weighing only 65 pounds, it can be carried by two men, or on the running board of an automobile.



The Upper Left View Shows the Folding Boat Covered with Its Coat of Canvas. At the Left, Covering may be Seen Partially "Buttoned," and the View Above Shows Its Appearance after "Buttoning"



Small Dwellings Set at Angle to the Street to Give More Light and Air and Greater Security against Intrusion: Heat and Electricity are Supplied from a Central Plant



MORE LIGHT AND AIR FOR SMALL HOMES

Some of the disadvantages of small dwellings built in groups for the sake of economy have been overcome in Germany by placing the houses at an angle to the street to provide more light and air for each dwelling. Such groups are easily supplied with heat, electricity, and water from a single center. Under the German plan each of the houses has a little garden, secure against the prying curiosity of neighbors and equally protected against intruders in the front and rear.

WOUNDED PLANTS ARE EASY VICTIMS OF GERMS

Tests designed to find a cure for a mysterious disease which has attacked plant roots, have been made at a midwestern university. Described as being similar to cancer in animals, the ailment, it has been found, gets into the soil and often causes the destruction of practically all of the plants in a nursery. So far, the only prevention found is to carefully examine all new shrubs for traces of the germs and to burn all infected ones. It is said that the disease either causes tumors or hairy roots to form and the plants become dwarfed and finally die. Much of the trouble is ascribed to careless handling, the germs entering through the wounds. Constant trouble is caused where grafting is poor, either through loose wrapping or an incomplete covering of the juncture by wax. In one test, where the students jabbed tomato plants with a needle dipped in the germs, a cauliflowerlike growth formed on the stems.

FOG FORCES PILOT TO TAKE VOYAGE TO EUROPE

Dense fog over the entrance to New York harbor recently, resulted in the pilot aboard one of the great transatlantic liners being carried on to Europe. It was decided that it was safer to do this than risk an accident by trying to find the boat sent to take him back to New York. Pilots have been carried across the ocean because of rough weather before, but this was said to have been the first time it had happened because of fog.

CRIPPLE DRIVES HIS CAR WITHOUT USING FEET

It sounds impossible that anyone could drive an automobile on a busy street and through crowded traffic without once

Auto Equipped with Special Devices to Enable It to be Easily Handled by Man Who cannot Use His Feet

using his feet. Nevertheless, it is done by an eastern man whose legs and feet have been practically useless for years. Ingenious additions to the usual equipment have made this possible. Crutches held under his armpits are bolted to the brake and clutch pedals. By throwing one or both of his shoulders forward those important pedals are easily operated. The gear-shift and emergency-brake levers have been extended to bring them easily within reach of his hands. The accelerator pedal is attached to a wire running up to the steering wheel and ending in a loop. The pedal is worked by inserting the thumb in the loop, and pulling. He operates the self-starter with his right thumb.

"WHITE WAYS" HALT CRIME BY FLOOD OF LIGHT

When the caveman, having cooked his supper by fire, kept the flames leaping during the night to frighten away threatening wild animals, he did what a city does today when it turns its streets into "White Ways." According to recent figures gathered to show the effect of illumination in dispersing evildoers, well-lighted streets are estimated to have reduced crime as much as 40 per cent. Centuries before there were any traffic problems, street lights were hung to protect wayfarers from thieves and cutthroats. First the naked torch, then the candle, then the oil lamps, then gas, and finally electricity have been used. In 1810, in London, constables testified that the gas-lighted streets they patrolled were freer of crime than unlighted thoroughfares. Forty years ago when electric street lighting was new, the same comparison was made between gas and electrically lighted streets in Boston.

CITRUS GROWERS USE GAS TO PRESERVE FRUIT

Carbon-dioxide gas, first used in the citrus industry of Florida to color fruit, is now being employed as a measure for controlling stem-end rot. When the gas is applied to the fruit, the stems dry up and drop off, thus removing one of the principal causes of early decay. Gassed fruit keeps from 20 to 30 days longer than fruit that has not been treated.

FLOATING WATER WHEEL TAPS CURRENT'S POWER

Requiring neither fuel, oil, nor care, a floating water wheel has been devised by a South African engineer for tapping power from a stream's current. The device is simple. As the current sweeps against the paddles they revolve the drum, generating enough power to operate a force pump. Cables are used to anchor

Floating Water Wheel Moored to Bank of River Acts as Pump

the wheel to shore. The outlet pipes deliver the water 210 feet away from the water wheel and about 50 feet above it.

POCKET GAUGE TELLS AMOUNT OF ALCOHOL IN LIQUID

Prohibition agents in an eastern state have been equipped with a pocket apparatus with which the amount of alcohol in any liquid can be quickly determined. Another advantage is that its size makes it easy for an officer to carry it about, concealed on his person. Tests indicate that the instrument is very accurate. For fermented liquors, such as beer, only 10 minutes are needed to find out their strength; while for distilled liquors, the percentage of alcohol can be found in two minutes. A small sample is sufficient to give accurate results.

SLIDE SAXOPHONE SPEEDS UP "JAZZ" MUSIC

Combining the trombone, Frisco whistle, and saxophone in one, a western manufacturer has designed an instrument which is much easier to play than the trombone. It has a range of several octaves, and can be tremoloed and slurred to produce "jazz" music and speaking effects. The new instrument speeds up dance and jazz music, is easy to learn, and costs but half as much as the trombone. Anyone of ordinary musical ability can learn to play it.

PATTERN OF WALL PAPER INSTANTLY CHANGED

As many as fifty designs of wall paper can be shown in a room within one minute by a device, similar to the magic lantern, made by an electrical company. Wall designs of various kinds can be displayed at will by merely changing the tinted glass plate of the projector which is concealed within the room. Colors can be shown to fit the taste of any housewife.

WEATHER PROPHET CLIMBS OVER 400 MILES

In completing his 700th ascent from a cabin in the heart of the Canadian Rockies to the summit of a mountain, a weather prophet for the Dominion government has climbed a total height of more than 400 miles. He makes the trip every two weeks to read weather instruments, 8,000 feet above sea level. The combined altitudes of these many ascents total several times the distance to the peak of Mt. Everest, the highest mountain in the world.

Canadian Weather Prophet, Who has Climbed More than 400 Miles, Reading Instrument Records on Top of Mountain

WAR ON GAME-DESTROYING ANIMALS URGED

In an effort to protect game and birds, a nation-wide campaign has been begun to keep meat-eating animals and killer birds in check. Golden eagles of Alaska, it is said, take a heavy toll of mountain-sheep lambs every year, while hawks destroy untold numbers of game birds. One hawk can kill 200 quail in a season, it is estimated. A game commissioner recently made an appeal to clubs and sportsmen to destroy lynx, bobcats, hunting house cats, red foxes, gray foxes, red squirrels, weasels, house rats, hawks, and owls.

AUTOMATIC TOOTHBRUSH ATTACHES TO FAUCET

Care of the teeth is rendered easier by an automatic toothbrush which operates

Rotary Toothbrush, Which Attaches to the Faucet, is Operated Automatically by Water Power

on the same principle as the "buffer," used by dentists in polishing tooth surfaces. The brush is driven by a small water motor attached to the faucet, power being transmitted by a flexible cable. All that is necessary is to apply the paste to the brush, turn on the faucet, and the water does the rest.

NEW DIVING BELL WALKS ON SEA'S BOTTOM

Propelled along the bottom of the sea by four long arms, or legs, near its base, a new type of diving bell has been designed by a western engineer. Cylindrical in form, it is claimed that it will permit work at a depth of 750 feet. Powerful lights shining through heavily protected windows, illuminate the water for many feet. The arms and legs are operated by the diver within the bell. Weighing about a ton, the chamber is lowered over the side of a boat by a derrick, and communication with the surface is made possible by telephone wires. It is claimed that its use will afford greater freedom of action in working on wrecks at great depths.

MANY STRANGE ANIMALS IN PRIVATE ZOO

One of the largest private zoos in the world is the property of G. Tyrwhitt-Drake, of Kentish Pasture, Scotland. Among his remarkable collection are 50 horses, mares and foals of famous pure-blooded white stock, whose origin dates back to the time of Queen Isabella of Spain. In addition, there are many beautiful and rare specimens of yaks, leopards, lions, tigers, jackals, hyenas, antelopes, and white camels. They are tended by a small army of keepers, and there is a good-sized hospital for the isolation and treatment of sick animals. The owner takes special pride in his pet lion "Poilu," which was formerly the mascot of the 19th Army Division. "Poilu" is said to have been in the front-line trenches several times during the war, being wounded twice by stray bullets.

BELLOWS IN OVERSUIT HELP KEEP WEARER COOL

Something new in one-piece oversuits has been patented for the use of workers and sportsmen. Made of tough khaki, the front half of the top opens like a coat, only the back being permanently attached to the trousers. By the movements of the body, the blouse effect at the rear acts as a bellows, giving a constant circulation of air about the upper

Work Suit Combines Comfort with the Greatest Possible Utility for Sportsmen and Toilers

half of the body. It is hung from both the waist and the shoulders.

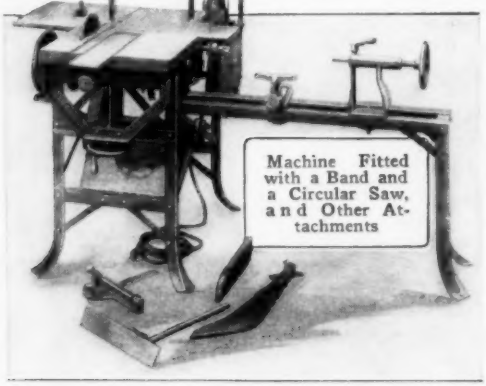
¶Recognizing that water pressure upward, as well as downward, is a source of power, an inventor with vision has developed reaction-turbine units that can be mounted directly over an artesian well. They range in size from 150 to 2,000 watts and are direct-connected to electric generators.

Bad-Tempered Four-Horned Ram Trying to Speak Spanish to a Young Persian Llama. Below, What is Claimed to Be the Smallest Donkey in Europe, Perhaps in the World, Only 28 Inches in Height

Hybrid Collie Puppies Paying a Visit to Their Father, a Wolf, at Private Zoo in Europe

WOODWORKING MACHINE HAS MANY CONVENIENCES

Many conveniences are embodied in a new woodworking machine intended for light work. Both a band and a circular saw are provided, as well as a jointer and an adjustable bedplate, for accurately gauging the depth of cut. Another feature is the inclusion of a reversible spindle shaper, suitably mounted to accommodate various molding set-ups. A sanding disk is also furnished, 10 inches in diameter, accurately machined to a smooth finish. A wood-turning lathe attachment permits turning of stock up to 14 inches in diameter. The machine can be operated from line shafting, by a gas engine, or electric motor, and is suitably equipped with a ½-horsepower motor, lamp cord, and switch where current is available.



Machine Fitted with a Band and a Circular Saw, and Other Attachments

RAPID SCALE EASILY SOLVES HEATING PROBLEMS

There has recently appeared on the market a scale that makes possible rapid and accurate calculations for heating and ventilating work. The scale is in the form of the ordinary slide rule and has two slides and a single runner with a cross hair marked on the glass. One of the features is the ease with which the amount of radiation required to heat a building of known dimensions can be computed. It will give values for hot-water systems, steam, vapor, and vacuum, and for either direct or indirect radiation. With it, the expansion due to change in temperature of a pipe and the heat lost in a pipe line of known length and diameter can be calculated.

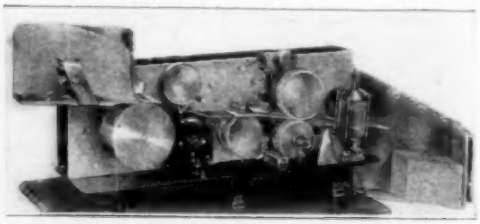
A Slide Rule That Greatly Simplifies Heating and Ventilating Calculations

MUD USED TO LUBRICATE OIL-WELL BITS

One of the most troublesome tasks of an oil-well driller is that of lifting the drill every four or five hours to refill the lubricator with oil, so that the rock bits will cut more easily. This trouble will be eliminated if tests now being made in an oil well prove that the forced circulation of mud in the hole serves the purpose as well as oil. It is claimed that the experiment thus far shows that the bits do not wear any faster with the mud than they do with oil.

SEALER AND PERMIT PRINTER OF LARGE CAPACITY

A small, portable machine for printing postal-permit marks on envelopes has recently been placed on the market. The machine not only prints the permit marks, but automatically feeds, counts, moistens, seals, and stacks the envelopes, leaving the operator's hands free for loading and unloading the envelopes. The machine is electrically operated, and has a capacity of 12,000 envelopes per hour.



A Machine That Prints Permit Marks, Feeds, Seals, and Counts 12,000 Envelopes per Hour

The machine can also be used for imprinting second and third-class matter, and will imprint without sealing, seal without imprinting, or merely count the envelopes, as required. It is unnecessary to send the machine to the post office to be set for a designated number of impressions.

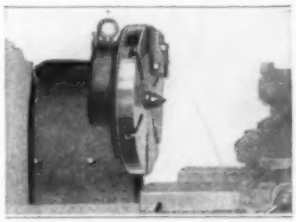
¶Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

SMALL PLUNGER PUMP USES ELASTIC RING VALVES

A small high-speed plunger-pump has been designed to use elastic rubber bands of circular cross section for suction and discharge valves. These are said to be noiseless in operation, unaffected by the speed of the pump, and easily replaced when necessary. This form of valve also allows for a large port opening which encircles the barrel of the pump, and thereby increases efficiency to a marked degree.

SUB-HEADSTOCK AIDS CUTTING OF LONG-LEAD SCREWS

Screws and worms with extra-long leads can readily be cut by means of a new lathe attachment. The mechanism consists of a gear reduction, driven from the nose of the regular lathe spindle, and furnished with a driving faceplate and a dead center. The frame is mounted on the ways of the bed, and is backed against the regular headstock housing. With the regular lathe gearing, screws with leads as long as 4 inches can be cut; screws with leads up to 12 inches long are cut by means of special change gears.



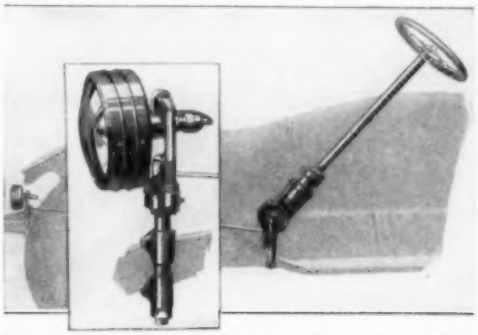
While the cutting of long-lead screws is the primary purpose of the attachment, it is also of value where work of extreme accuracy is to be turned, requiring the use of dead centers, and for forming cutters, etc., with wide tools, where exceptionally low speeds are required.

GREATER SPEED IS CLAIMED FOR SPIRAL-FLUTED TAP

A staybolt tap that has proved a success after most exacting tests is machined with spiral flutes. It is designed with a taper that has proved to have a distinct advantage over the common tapers, adding greatly to the life of the tool. The spiral flutes provide free cutting edges, thus enabling the tapping speed to be increased without increased friction. The results of the tests indicate that the new tap will do more work, in less time, than any other form of tap.

AUTO PILOT LIGHT TURNS WITH STEERING WHEEL

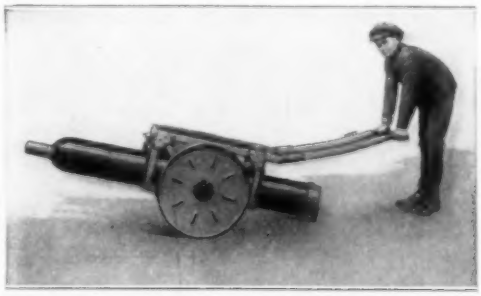
Responding to the slightest turn of the steering wheel, a small automobile pilot light provides constant illumination over the spot where the wheels will pass. It is intended to be mounted at the front of the car near the road, and may be clamped to the bumper or frame bracket. The directing rod is connected to the steering arm.



Pilot Light in Position on Car; Inset, Close-Up of Pilot Light

HEAVY GAS TANKS CARRIED ON TWO-WHEELED TRUCK

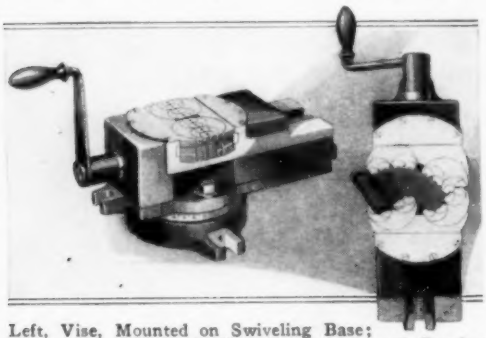
Transportation of the heavy gas cylinders used in welding and refrigeration is greatly facilitated by the use of a new French two-wheeled truck. The truck is wheeled to the center of a cylinder, with the wheels straddling it, then the long handle is raised; this forces a pair of jaws, mounted at the front of the truck, to grip the cylinder firmly. The handle is next lowered, and a second pair of jaws, at the rear of the truck, grips the cylinder. The cylinder is now suspended and ready to be wheeled away. One quarter turn of a small crank releases the cylinder, allowing it to slide to the ground.



Raising Gas Cylinder from Ground with Carrier, Ready for Transportation

IMPROVED VISE THAT GRIPS ODD-SHAPED PIECES

A new type of vise, which is adapted for gripping work of any shape, has recently been developed. The main jaws of



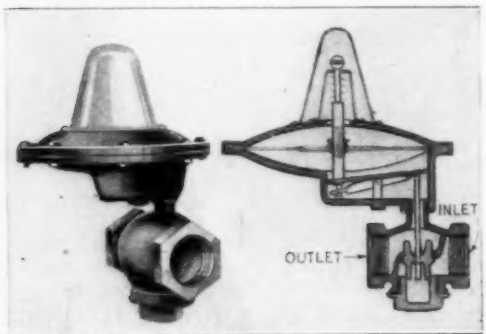
Left, Vise, Mounted on Swiveling Base; Right, Plan View of Vise Gripping Curved Bracket

the vise are semicircular in shape, and each contains two smaller semicircular pieces; these, in turn, are fitted with similar pieces, and so on, so that finally there are eight small jaws bearing on either side of the work. As all these parts can be adjusted independently, it is an easy matter to set them to conform to work of any shape, when, upon tightening the vise, the work will be held firmly at a number of points, and with no danger of distortion.

The vise may be used as a plain bench vise or fitted with a swiveling base for use on bench or machine, and will prove of great value in any machine shop, where it will eliminate many special fixtures.

GAS VALVE AVOIDS DEATH AND FIRE DANGER

Because of the menace from fires and explosions caused by sudden reductions in gas pressure which extinguish the lights and then allow the gas to flood a building or home, an automatic valve has been designed which cuts off the supply when the pressure drops. The valve then remains shut until it is opened by hand.



This Valve Prevents Danger to Life Due to Pressure Drop in Gas Lines

SLIDING CYLINDERS FEATURE NEW DIESEL ENGINE

An engine that is different, in many respects, from any Diesel engine now on the market, has undergone experimental tests in England. The novel feature about it is that its cylinders move with the pistons, but through a much shorter distance or stroke. The result of the tests was so satisfactory that the builders are proceeding with the construction of a much larger engine.

It is claimed that the new engine has not only half the weight, and occupies about half the space of the ordinary Diesel engine, but has much fewer wearing parts, and that the engine could replace the ordinary steam engine in a ship and permit the entire boiler and bunker space to be used for the carriage of cargo.

MICROMETER SNAP GAUGE AIDS INSPECTION WORK

Snap-gauge micrometers, that eliminate the necessity of providing a large number of solid snap gauges, are the latest aids to production and inspection work.

The tools resemble ordinary micrometers, but have double heads and anvils, each head being set to a standard and locked independently, on inspection work. On production work, the minimum-limit head can be set and locked, while the other is permitted to revolve freely, thus enabling the operator to measure the work as it progresses, and eliminating guesswork and loss of time.

The tool is made in three sizes, measuring up to 3 inches, and can be furnished with a convenient bench stand.

¶A piece of clear celluloid makes a fine substitute for the glass in a slide-rule runner, should the latter be broken. A light scratch, filled in with India ink, is used as an index mark.

All Shop Notes published in 1922, in book form—Fifty Cents—from our Book Department.

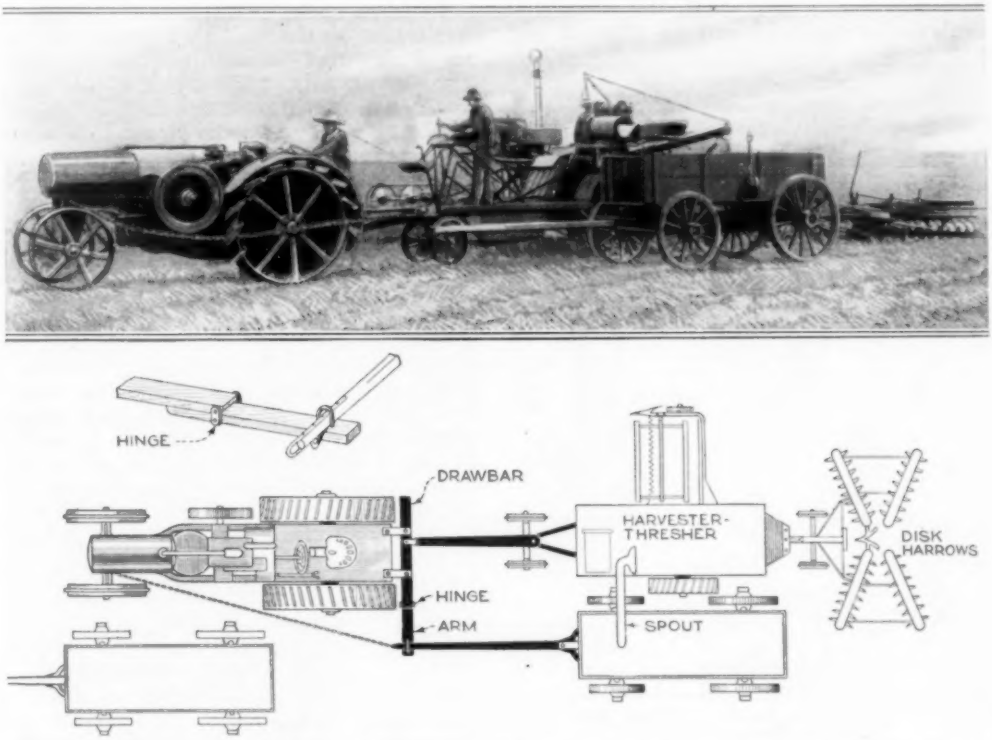
Attaching Wagon to Harvester-Thresher

BY GEO. G. McVICKER

WITH the speeding up of crop production, great improvements have been made in machinery for planting, tending, and harvesting, but many manufacturers, when building an implement, plan only for the operation of one particular machine at a time. This leaves it to the farmer to devise hitches that will enable him to use several machines together.

Harvester-threshers seem to be built with the idea in mind that horse-drawn wagons will be used to take care of the threshed grain, and hence the horses that the farmer had hoped to dispose of when buying his tractor, must be kept and used.

One western farmer has disposed of this problem in the following manner: The wagon that receives the grain is attached to the tractor by means of a hinged arm fastened to the tractor drawbar, as shown in the illustration. The hinge shown, which is made from short pieces of flat iron and iron rods, allows the arm to support the wagon tongue without the use of a tiebar. Into the outer end of the hinged portion, a large staple is driven, just



Method of Hitching Wagon to Harvester-Thresher to Receive the Threshed Grain: Above, Photo Showing Outfit in Operation; Below, Layout of Tractor, Thresher, Wagons, and Harrow, with Detail of Drawbar Hitch

far enough to allow room for the wagon tongue to enter freely.

The wagon, when first hitched on, is connected close to the arm by means of the chain shown, the front end of the chain being attached to the tractor. This allows the rear end of the wagon to be filled; the chain is then let out a little more, allowing the wagon to fall back as the harvester moves forward. This is continued until the wagon is evenly filled.

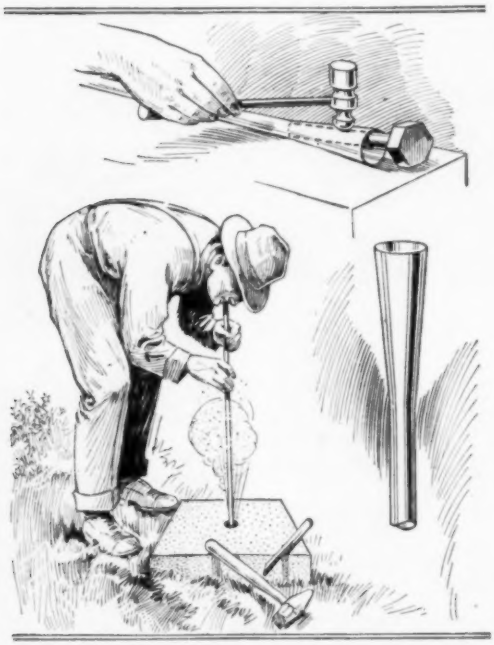
The empty wagons are left in the position shown at the lower left, and, when one is ready to be hitched on, the chain is unhooked, the arm thrown up so as to pass the empty wagon, then dropped, and the wagon coupled on as before.

In the harvesting season in the central and western plains, the crop is not only harvested and threshed in one operation, but the seed bed is prepared, at the same time, by a disk harrow, attached to the rear of the combined machine.

There is always a side draft in these large harvester-threshers, due to the cutter bar extending so far to one side. In attaching the harrow to the rear of the machine, the drawbar or hitch should be made adjustable, so that the harrow can be set sufficiently to one side or the other to counteract this side draft. This is particularly convenient when harvesting on sidehill fields, where the machine has a tendency to creep down.

Cleaning Drill Holes in Rock or Concrete

When drilling holes in rock or concrete by means of a star drill, the dust that collects in the hole can be cleaned out



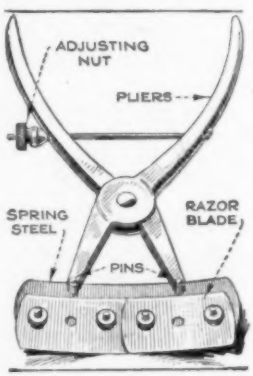
Blowpipe for Removing Accumulated Dust from Holes Drilled in Rock and Concrete

with a blower of the kind shown in the illustration. The blower is merely a length of ⅜-in. light brass tube, flared slightly at one end by inserting a hexagon-headed bolt or screw into it, and tapping the pipe with a hammer, as shown in the upper detail. After dropping the flared end down near the bottom of the hole, the dust is blown out quickly and thoroughly. It is necessary, of course, to keep the eyes closed while blowing, to keep out the dust.

In hard rock, when it is necessary to use water on the drill to keep it cool, the resulting "mud" in the hole can be picked out by gently tamping the blowpipe down, which will pack the mud in the end of the pipe. The pipe is cleaned by blowing, tapping, or by pushing a wire through it.—Dr. G. E. Abbott, San Diego, California.

Novel Skinning Knife

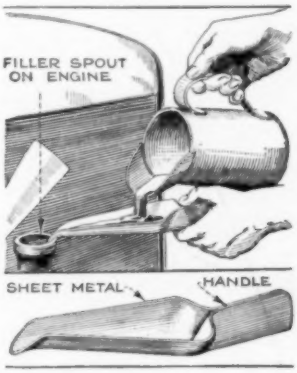
When skinning a beef carcass there are two dangers for the novice: one is cutting a hole in the hide, which decreases its value, and the other is leaving too much flesh on the hide, which causes a heavy dockage. A useful skinning tool, which eliminates much of this trouble, is shown in the illustration. It consists of a pair of ordinary 6-in. pliers with a hole drilled through each of the jaws, and in each handle, as indicated, the pliers being annealed for the purpose. A piece of spring steel, about 1 in. wide, is drilled and attached to the jaws by means of pins riveted loosely through the holes. Two safety-razor blades are attached to the spring by means of small bolts, fitted with thumbnuts; the cutting edges of the blades project about 1/16 in. beyond



the edge of the spring, and the inner ends overlap, as shown. A small, long bolt, fitted with a thumbnut, is passed through the holes drilled in the handle, to complete the device. By slightly pressing the steel spring between the jaws and screwing up the thumbnut on the handle bolt, the blades will be bent in a curve to suit many parts of the carcass. The tool is manipulated with one hand, being pushed along with the protector next to the hide, and the separated part of the hide is held with the other hand.

Funnel for Filling Crankcase

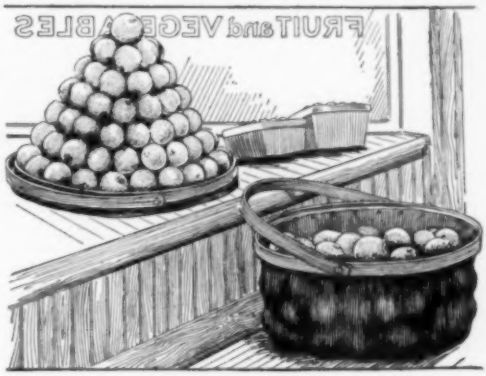
The funnel illustrated has several advantages over many other types used for pouring oil into the filler spout on an automobile crankcase, as it has no restricted opening, and is independent of the measure. A number of funnels of this type, varying in size, are used in a gasoline-service station in Washington, D. C. They are made of sheet metal, such as galvanized iron, which is available almost everywhere and can readily be bent to the shape shown. The oil may be poured as rapidly as it can be taken by the filler spout on the engine. A considerable saving of time is effected by the use of these funnels, and they are cheap to make; for this reason particularly they are recommended for service stations.



Collapsible Baskets Simplify Fruit Display

The proprietor of a fruit store, who made a practice of changing the display in his show window every day, found that the fruit could be removed quickly, and without any danger of injury, by using collapsible baskets of the type illustrated. In addition to their usefulness in removing the fruit, these baskets also served to keep the piles of fruit intact, as the rims of the baskets supported the bottom layer of each pile.

Each basket consists of a cloth bag, tacked to a barrel hoop, to which half of another hoop is riveted to serve as a handle. These hoops are covered with colored crêpe paper to give them a neat appearance. When the fruit is displayed in the window, the basket is folded down neatly, as indicated, the fruit being piled inside of the rim. To remove the fruit, the basket is lifted and the pile is carried away. This method of removing fruit from show windows is especially valuable during winter, when the fruit must be removed every evening to prevent it from being injured by frost.



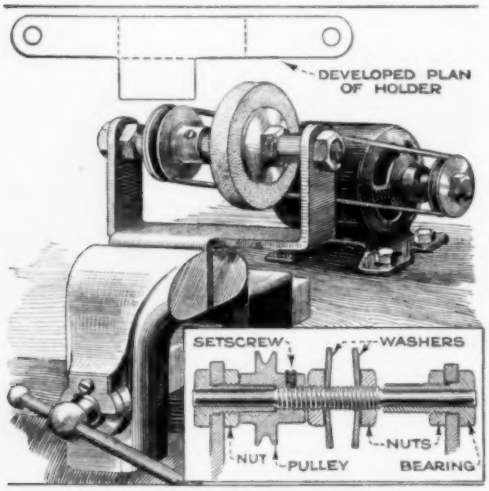
Collapsible Cloth Baskets Support Piles of Fruit in Show Windows and Facilitate Their Removal

Curing Misfiring of Truck Engine

The erratic firing of a light-truck engine when running at low speeds, caused by the leakage of air around the intake-valve stems, was cured in the manner illustrated. The valves and cages were removed, and the upper end of the guide in each cage counterbored, to a depth of ¼ in., with a drill bit ¼ in. larger than the valve stem. In the stuffing box thus formed, a couple of felt washers were placed, and a light coil spring put over them, and held in position by the mainspring washer and pin, forcing the felt tightly against the stem and shutting off all leakage. A few drops of oil were applied to the washers occasionally, to prevent wear of the guides and stems.—Maling C. Metzer, Silver Creek, Neb.

Vise Grinder of Simple Design

The simple grinder shown in the drawing will prove of convenience in a small workshop, where there is not enough



A Simple Grinder Held in the Vise Is of Considerable Advantage in the Small Workshop

space for a stationary grinder, or where a stationary grinder would not be used often enough to justify its installation. The holder that supports the spindle is made in one piece; it is cut from boiler plate and bent to the shape shown, leaving two lugs to carry the bearings for the spindle, and one for holding the fixture in the vise. A V-pulley and an emery wheel are mounted on the threaded spindle, and bronze bearings are threaded into the lugs and fastened by locknuts, as shown in the lower detail. An electric motor is fastened to the workbench behind the vise, the slots in the base of the motor permitting proper adjustment of the belt.

Removing Rock Coatings from Fossils

The delicate task of removing the final rock coatings from newly unearthed fossils has been much simplified by the research scientists of the California Academy of Science, who have successfully used for this purpose the unusual combination of the hottest flame known to industry, and a drop of cold water.

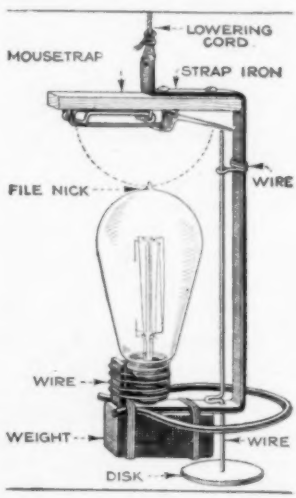
The new method not only facilitates what otherwise is a most difficult task, but it also reduces the danger of breaking or otherwise injuring the fossil during the final step of cleaning the rock coating from it. A fine jet of oxyacetylene flame, the temperature of which is about 6,300° F., is directed upon the last of the rock coating remaining on the fossil. Immediately afterward, a drop of cold water is put on the heated spot. The heating and cooling takes place too quickly to cause expansion and contraction of the fossil underneath, so that only the outside rock cracks and breaks away, leaving the fossil itself uncovered and uninjured.

This method is especially useful if the fossil is irregular in shape. If it is large, the rock coating must be broken off in small pieces. The method bids fair to become the standard practice with fossil experts, because it reduces to a minimum the risk of damaging the fossils while they are being cleaned.—Roswell S. Britton, New York City.

Novel Sampler for Deep Wells

The device shown in the illustration was improvised to obtain samples of water from the bottom of a 160-ft. well. It consists of a frame carrying a burnt-out electric lamp, which is filled with water by having the tip broken off automatically when the device strikes bottom.

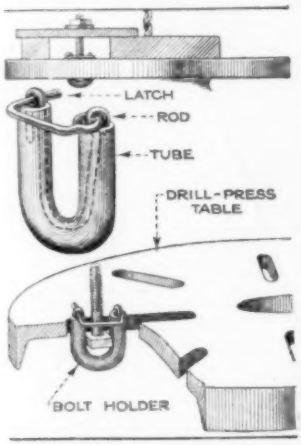
The lamp, and the mechanism for breaking the tip, are held by a strap-iron frame, bent to the shape indicated. A spring mousetrap is attached to the frame in an inverted position, so that its lever, upon swinging around, hits the tip of the lamp, and breaks it off. The trap is tripped by means of a plunger, which consists of a length of wire with a disk soldered to the lower end, as shown; the plunger is pushed up and springs the trap when the disk strikes the bottom of the well. A sharp bend in the wire prevents the plunger from falling out of the frame, and a circular wire guard, about twice the diameter of the plunger disk, prevents the trap from being sprung should the device accidentally come in contact with the wall of the



well. A weight is attached to the lower part of the frame to insure its sinking in a vertical position. A coil of heavy wire, attached to the lower end of the frame is used like a screw socket, the lamp being screwed into it. After the lamp is in position, a file nick is made in the tip to localize the break as much as possible. The water is quickly drawn through the small opening thus made, and the device is then raised to the surface where the water can be examined.

Drill-Press Bolt Holder

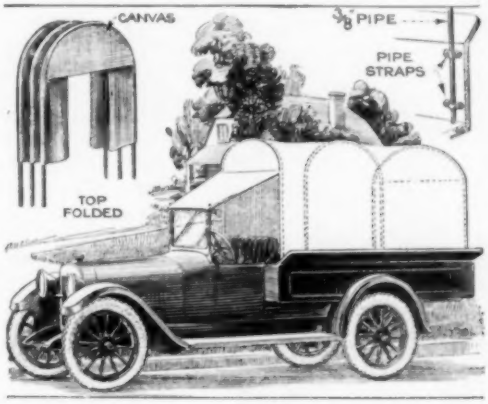
The holder shown in the illustration is handy when using bolts in the plain slots of a drill-press table. It not only keeps the bolts from turning when the nut is tightened, but also prevents the bolts from falling to the floor when the nut is removed. Some wire and a length of tubing are the only materials necessary to make it. The tube is bent to the U-shape shown, but before doing so, a length of wire is placed in it; after the tube is bent this wire is looped over at both ends. A latch is next made of the same size wire and attached, care being taken to leave the eye large enough to allow the latch to swing in and out of the opposite loop. When using the holder, the U-shaped wire is pushed through the slot in the table with the latch thrown back. To lock the holder, and to keep the bolt in position, the latch is swung around and pushed through the wire loop. Where it is necessary to use a bolt continually in a plain slot, considerable trouble can be avoided by using this holder, as with it a bolt can be held just as easily in a plain slot as in a T-slot.



¶When milling operations are finished, the cutter should be removed from the arbor, cleaned and placed in a wall cabinet or drawer, where it is kept from contact with other tools.

Detachable Top for Open Truck

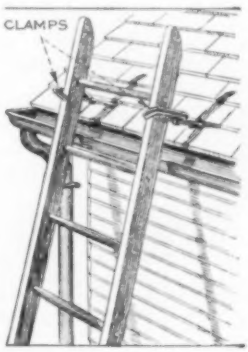
The drawing shows a simple detachable top for an open express-truck body. It consists of a heavy-canvas covering, held by three ribs made of 3/8-in. pipe, bent to the shape indicated. Semicircular pieces of canvas are used at the ends of the top, and an additional flap covers the driver. The top canvas is attached to the ribs by strips of canvas, sewed across them, and, when the top is erected, the flap is attached to the edge of the windshield as shown. The ribs are held by means of pipe straps screwed to the sides of the truck body, two straps being sufficient for each leg. A canvas top of this kind can be conveniently carried in the truck body.



A Canvas Covering for the Open Express Truck: It can be Attached or Detached in a Moment

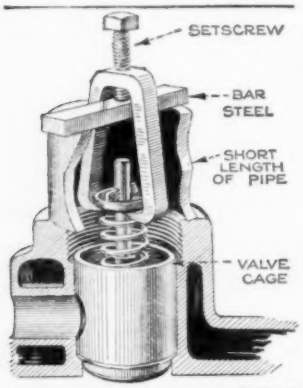
C-Clamps Support Ladder While Hanging Eaves Trough

When hanging an eaves trough, it is necessary to fit the upper end of the ladder with some attachment that will enable it to clear the trough. A simple and satisfactory attachment consists of two ordinary 4-in. C-clamps. These are fastened on the end of the ladder, as shown in the illustration, so that the thumbscrews rest against the first row of shingles.—W. B. Nicholson, Detroit, Mich.



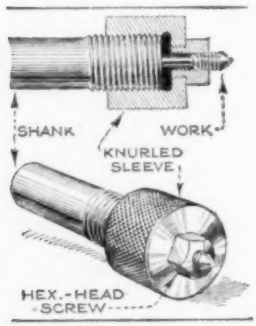
Valve-Cage Puller

On engines having overhead valves, a common method of removing a valve cage is to pry it out. The disadvantage of this practice is that the valve is frequently bent, making necessary a tedious repair job, or the renewal of the valve. To do the work without danger of injuring the valve, a simple cage puller of the type shown in the illustration has been found serviceable. It consists of a short length of pipe, with an internal diameter larger than the diameter of the cage, and a U-shaped steel rod, bent to form a hook for gripping the spring-retaining cap on the valve stem and fitted with a setscrew as shown. The hook is engaged with the cap and the setscrew tightened on a heavy steel bar placed across the pipe, releasing the valve cage from its seat without any danger of bending the stem.



Holding Small Screws in Lathe

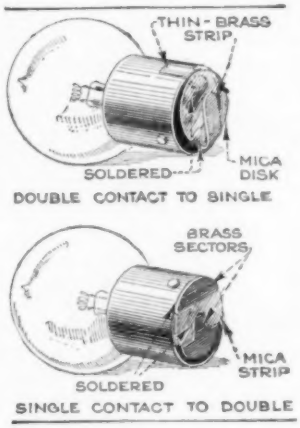
Any lathe hand who has attempted to hold small, short screws in a small chuck or in a drill chuck, while machining them, will appreciate the advantages of the screw holder shown in the drawing, which will hold them firmly even where only two threads can be used to chuck them. A short piece of cold-rolled steel, of suitable diameter, is either turned taper on one end, to fit the lathe spindle, or straight, to be held in a universal chuck; the other end is threaded, and a short length turned down to a small diameter, as shown. A knurled sleeve is then made to fit the threaded end, and is drilled and tapped, at its center, to fit a standard hexagon-head capscrew. Several of these capscrews are drilled and tapped, along their axes, to fit the various sizes of screws.



To machine a screw, the sleeve is screwed outward a few turns, the screw is placed in position, and the sleeve screwed inward, when the small-diameter nose of the shank butts against the screw, and locks it firmly. After machining, half a turn of the sleeve will release the screw, so that it can be unscrewed with the fingers.

Changing Base Connections of Bayonet-Socket Lamps

To adapt a double-contact automobile lamp for a single-contact socket, first see if one of the contacts makes connection with the lamp base. If so, well and good; if not, a connection must be made, which can be done with a drop of solder, or by means of a very thin-brass strip. A small strip of brass is soldered to the other contact, and doubled, as shown, so as to cover the center of the base; then a mica disk is placed in the fold, and cemented in place with shellac.

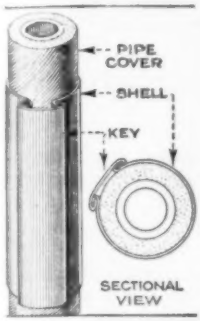


A single-contact base is adapted to a double-contact socket by filing the center contact down until it is nearly flush with the bottom, and soldering on a T-shaped brass strip or sector, as shown in the lower detail, care being taken that the strip does not touch the base. Another brass strip, making contact with the base, is soldered opposite this, as indicated. A strip of mica, covering the arm soldered to the center contact, is then cemented in place. The sectors must, of course, be arranged in such a position with respect to the pins that proper contact will be made in the socket. —H. H. Parker, Oakland, Calif.

Manganese steel is not susceptible to magnetism and cannot be magnetized; therefore, parts made from this material cannot be held on magnetic chucks.

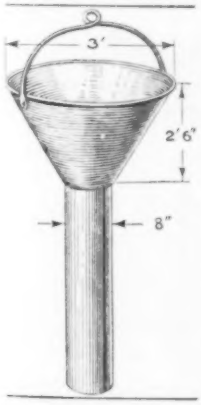
Protecting Pipe Covering

The magnesia covering used on steam pipes has not much mechanical strength, as it is covered only by a thin layer of cloth, and hence does not offer much protection to pipes passing through floors, or along walls where they are likely to be struck by trucks or material. A good, substantial protection for the covering was provided, in one such case, by inclosing the covering, to a height of 6 ft. above the floor, with a stovepipe-iron shell. The edges of the shell are crimped outward, so that a "key," made from a narrow strip of the same metal and having the edges crimped as shown, can be pushed over the edges of the shell, to draw it tightly around the covering and lock it. Keys of the same size can be used with various sizes of shells, the latter being cut to suit the diameter of the pipes and their covering. After the key has been pushed into place, the seams are carefully pounded down with a wooden mallet.



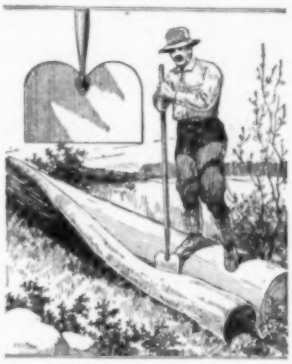
Placing Concrete in Water

If concrete is emptied loose and allowed to sink through water, so much of the cement is washed away that the mixture is spoiled. In the absence of other means of depositing the concrete, the device shown, which is called a "tremie," can be used to advantage. This device consists of an 8-in. galvanized sheet-iron pipe, reaching from the surface of the water to the point where the concrete is to be laid, a funnel with a bail being provided on the top of the pipe, so that it can be hoisted and lowered easily. In use, the pipe is completely filled with concrete, the bottom end being held down to prevent the concrete from running out. When the pipe is full, it is slightly raised to allow the concrete to run out gradually.



Tool for Peeling Logs

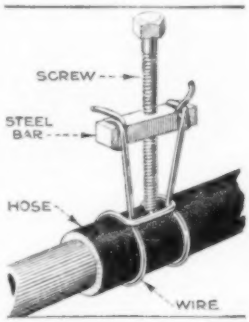
Peeling the bark from logs is heavy work, and any tool that will simplify it is worth making. Such a tool is shown in the drawing. It is simply an old hoe, with the neck straightened as indicated, and the blade formed slightly convex to fit the side of an average-size log; this is done by heating the neck and blade to a cherry red and then forging. The blade is sharpened, on the log side, with a file. In using this tool, the worker stands erect and can peel the log with surprising speed.—Jos. C. Coyle, Colorado Springs, Colo.

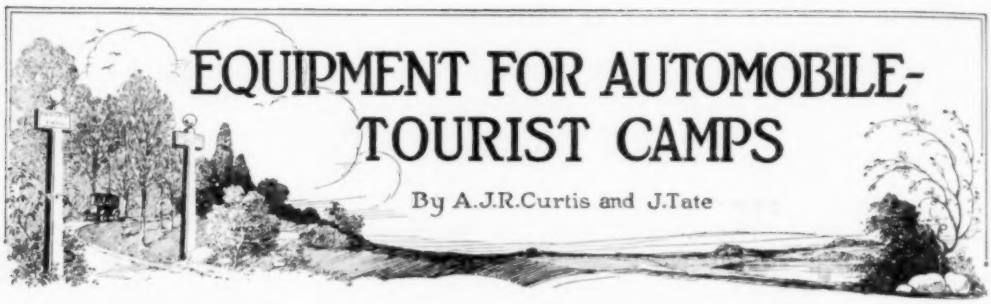


Wire Clamp for Garden-Hose Connections

The illustration shows a simple device for clamping rubber-hose connections with wire. The device consists of a ½-in. bolt, about 6 in. long, threaded its entire length and rounded at its end, to prevent injury to the hose. The bolt is screwed through a steel bar, drilled and tapped to fit and having notches filed around each end.

When using the device, a suitable length of galvanized-iron wire is bent to a U-shape, and wrapped around the hose in the manner indicated, the ends being drawn up tightly and wrapped around the notches in the steel bar. The bolt is then screwed down against the "bottom" of the U, until the wire is tightly drawn around the hose, after which it is only necessary to swing the tool over, thus bending the wire, and to cut off the ends about ½ in. from the bend. A pair of pliers is used to clamp the ends down.—John H. Yeakel, Everett, Wash.





EQUIPMENT FOR AUTOMOBILE-TOURIST CAMPS

By A.J.R.Curtis and J.Tate

Part II—Vaults, Bath, Garbage Boxes, Incinerators, Washing Platform, and Fountain

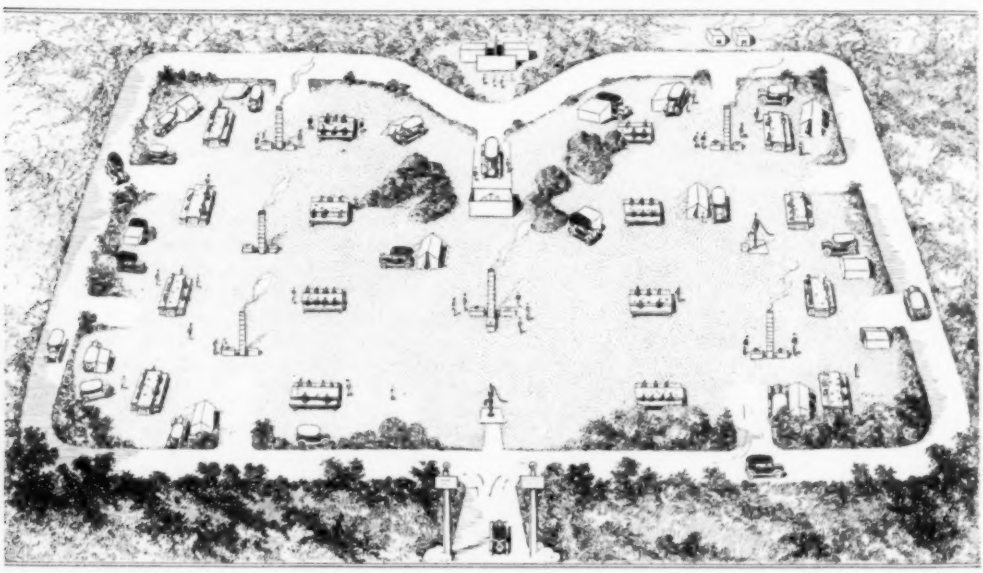
THE equipment shown in the camp layout given in Part I, while quite suitable for a small village or town camp, cannot be expected to serve where a very large volume of tourist traffic is certain or expected.

The equipment shown in the layout below, however, should enable a city to cater to a large number of tourists without overcrowding. The arrangement of the units, as in the smaller layout, is entirely suggestive, and will depend almost entirely upon the shape of the lot. In any event, garbage cans and incinerators should be placed a good distance from the tables, yet not so far that their use will be a burden, and therefore likely to be slighted.

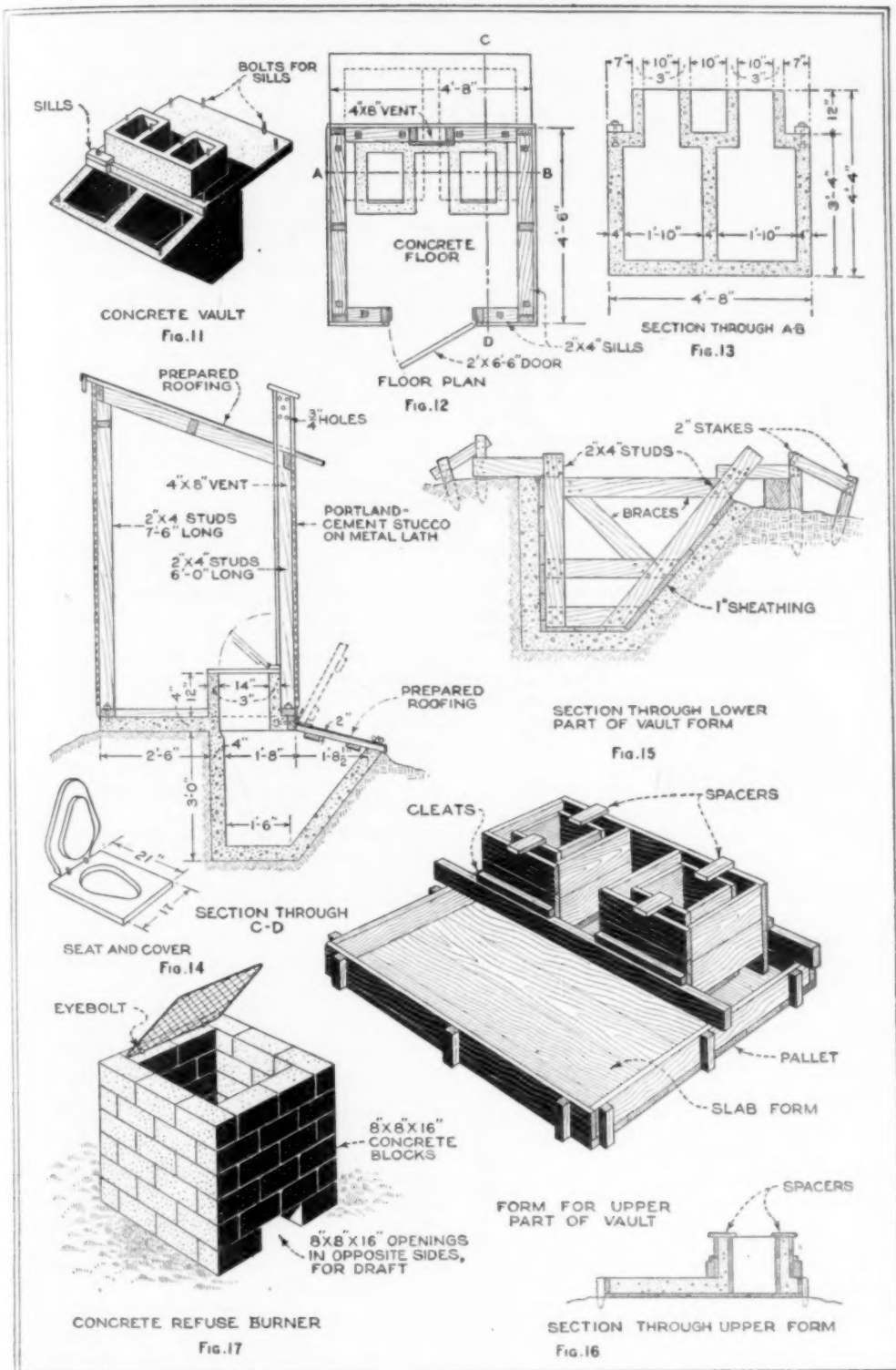
Toilet facilities in most camps are so poor as to constitute the principal objection, by many people, to the use of such camps. This not only keeps many tourists away, but is a positive menace to health, turning an outing for recreation into a period of exposure to dangerous germs. Where sewage systems are not available, a septic-tank system, or vaults such as shown in Figs. 11 to 19, should be installed.

The concrete vault proper is shown in Fig. 11, a section in Fig. 13, and a view of suitable forms in Figs. 15 and 19. The lower part of the vault is cast in place, as shown in Fig. 15. The form shown can be made of light lumber by anyone who can use hammer and saw, and need not be at all elaborate, so long as it is strongly enough braced to support the concrete; the layer of concrete forming the bottom is placed first, then the form is set in, braced in position, and the side walls poured.

While the bottom part is curing, the upper part may be made. A form that molds the slab floor and seat supports is shown in Fig. 19. This also need not



Suggested Layout for Automobile-Tourist Camp with Equipment for a Large Volume of Traffic: Toilets, Incinerators, Washing Platform, and Shower Bath may be Seen in the Background



Figures 11 to 16 Show a Very Easily Constructed Vault for Toilet Purposes, Where a Sewage System is Not Installed, or Where No Disposal Field for a Septic-Tank System Is Available. Figure 17 Shows a Simple Concrete-Block Refuse Burner or Incinerator

be elaborate, as it will only be needed for one or two pieces. When cured, the slab can be moved into position, and the joint between upper and lower parts made with neat-cement mortar.

The housing may be made of concrete, cement plaster on metal lath, brick, or wood, as convenient. The wood sills for the structure, if the latter is made of metal lath and stucco or wood, are attached to the vault by means of bolts imbedded in the concrete, as shown. The construction shown in the drawing is Portland-cement stucco on metal lath, with wood studs, vent, and roof, and serves well. It would perhaps be well to have this part of the work, or at least the plastering, done by a competent contractor. The concrete used is a 1:2:3 mix, and approximately 7 sacks cement, 13½ cu. ft. sand, and 20 cu. ft. pebbles will be required.

In order to keep the camp neat and orderly, refuse burners and garbage cans should be provided. The burners, or incinerators are best made of concrete blocks, 8 by 8 by 16 in. in size, as shown in Fig. 17. The draft openings are made simply by leaving one block out of the lower courses, on opposite sides. A cover, made of heavy wire netting, bound with ½-in. round-iron bar, should be provided, to keep charred paper, etc., from flying around the camp. The eyebolts for attaching the cover, are set into holes chipped in the blocks and filled with neat cement. Sixty blocks will be necessary for each burner.

The garbage cans, Figs. 18 and 19, are made in one piece of concrete reinforced with wire mesh, the walls being 2 in. thick. The forms for these need no description, as the method of making them is obvious. The bolts for the top covers and the clean-out door hinges are imbedded in the concrete when it is placed. A 1:2:3 mix is used here also; 2 sacks cement, 4 cu. ft. sand, and 6 cu. ft. pebbles being used for each container.

Where running water is available, an automobile-washing platform, shower bath, and drinking fountain will be highly appreciated.

The washing platform, Fig. 20, is merely a 10 by 18-ft. concrete slab, with a low curb on three sides, and a gutter, running to a sewer, on the fourth. Most cross-country tourists wash and lubricate their own cars, so a floor of this type will be well patronized. The floor should slope ¼ in. to the foot toward the gutter, but the curb is level all around; this, in a floor of the size specified, will make the curb 1½ in. high at one end, and 6 in. high at the other. The slab itself is 6 in. thick. With what has been shown of form construction previously, no difficulty will be experienced in making this platform. The concrete used for the floor should be a 1:2:3 mix, while that for the curb should be 1:2½:4, the amount of material necessary being 31 sacks cement, 66 cu. ft. sand, and 10 cu. ft. pebbles.

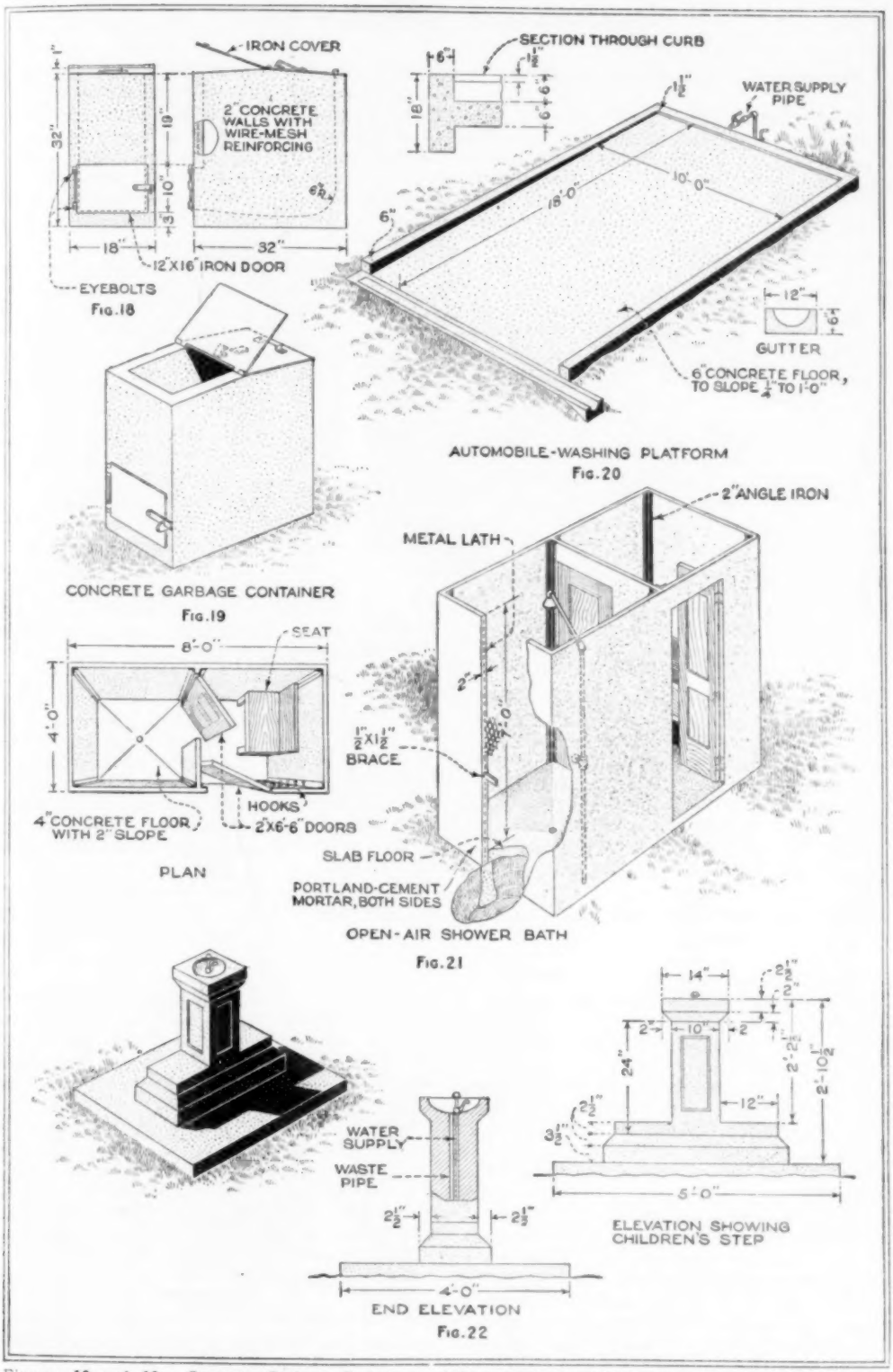
The simple shower bath shown in Fig. 21 is another highly desirable feature. The walls are simply made of Portland-cement mortar, plastered on both sides of metal lath, and the frame is 2-in. angle iron, imbedded in the footings and braced by ½ by 1½-in. flat-iron bars, where necessary. The floor and footings are cast in one piece, and the floor beveled from the sides toward the center drain pipe, in the shower compartment, while the cement is still soft. The dressing compartment is fitted with a seat and clothes hooks. No top is necessary on the structure. The floor is made of 1:2:3 concrete, the footings of 1:2½:4, and the walls of 1:3 mortar; the material required is 35 sacks cement, 100 cu. ft. sand, and 38 cu. ft. pebbles.

The fountain shown in Fig. 22, while not essential, will prove of convenience. The water-supply and drain pipes are first placed and connected, and the slab and pedestal cast around them. Slab and pedestal can be cast all in one piece; note that a step, 8½ in. high, is provided on each side of the pedestal, for the convenience of children. The paneling on the sides of the pedestal is formed by means of blocks, tacked to the form sides, as shown in Fig. 9, Part I. For the fountain, 3¼ sacks cement, 6¼ cu. ft. sand, and 10 cu. ft. pebbles is necessary, a 1:2:3 mix being used throughout.

A camp provided with equipment of the type described in this article will be a credit to any community, and, as emphasized in Part I, will attract the better class of tourists, thereby benefiting local business.

When the volume of tourists has become large enough, it will pay to have an employe stationed at the camp to sell supplies, to keep the grounds clean, and to render service of one kind or another to the tourists.

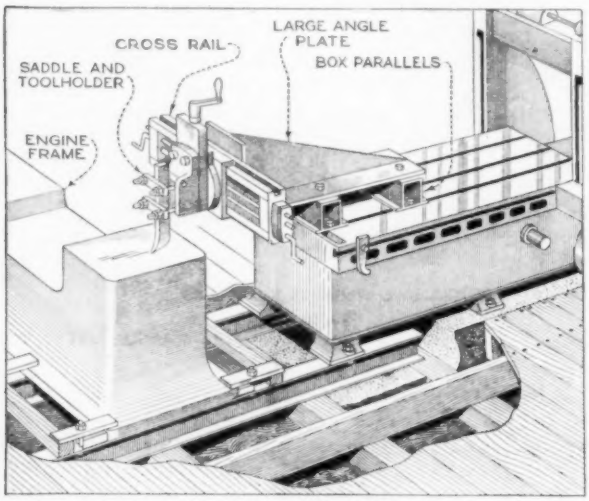
¶Sand or pebbles for concrete work must be clean. If coated with clay, for example, the cement cannot adhere to the surface, and thus cannot perform its binding function.



Figures 18 and 19: Concrete Garbage Container, of Good Design, and Easily Constructed. Where Running Water Is Available, the Automobile-Washing Platform, Shower Bath, and Drinking Fountain, Shown in Figures 20 to 22, can be Provided, and will be Greatly Appreciated

Planer Converted into a Shaper

No matter how well planned and equipped a machine shop may be, there usually comes a time when the largest available machine is just too small for a big job. These big jobs must be done, and, rather than farming them out to another shop, the management orders the job to be done in some manner that calls for ingenuity. The arrangement illustrated for converting a planer into a shaper is an example. The work machined with this tool consisted mainly of large engine frames and roll housings, which were too long and heavy to pass through the planer housings.



An Attachment That Adapts the Planer to Operations on Work beyond the Capacity of the Housings

The method used in converting the planer to its new use was quite simple. The planer cross rail was removed from its housings and mounted on a large cast angle plate as illustrated. This angle plate, with the cross rail attached, was then set up on box parallels and clamped to the table. The work was supported on heavy I-beams which were bolted to the lower flange or feet of the planer bed. Bolting the I-beams to the base of the machine in this manner made it necessary to remove about 3 ft. of the foundation. After the beams had been attached, they were leveled with the planer table and supported on timber sills. This arrangement for supporting the large work was made flush with the shop floor and formed a permanent addition to the planer equipment.

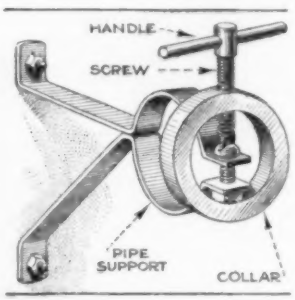
After the work had been leveled on the supporting steel beams, it was clamped in position. The saddle and toolholder were fed by hand, and were able to work over as wide a range as though mounted on the housings. The overhang of the cross rail was made as short as possible, the work being positioned close to the end of the planer shears. Considerable power is saved by this method of machining heavy work, as the weight of the cross rail and angle plate is negligible when compared with the weight of the job.

When the cross rail is mounted high, it is advisable to ballast the table with a few heavy castings in order to hold it firm.

Tightening Pipe-Line Hangers

A common hanger for supporting light pipe lines that are used in connection with exhaust fans, and for similar purposes, consists of a bracket made from two pieces of thin, flat iron, fastened at one end to the wall or roof, bent at the other end to inclose the pipe, as shown in the illustration, and fastened with a screw and nut. Anyone who has done the job knows how difficult it is to bring the ends of the bracket close enough to allow the screw to be inserted and the nut to be started, especially as the operator is nearly always perched on a ladder. On a lengthy job of piping, using these hangers, it was found that the tool shown in the drawing greatly facilitated the work.

To make the tool, a long ½-in. screw was ground at one end to the shape of a screwdriver point, and a pin driven through the other end to serve as a handle. An old collar of suitable diameter was obtained, and the screw run into the ½-in. setscrew hole already in it. In use, the screw is turned back far enough to allow the collar to be slipped over the ends of the bands, and the small clamp screw is dropped into place. The ½-in. screw is

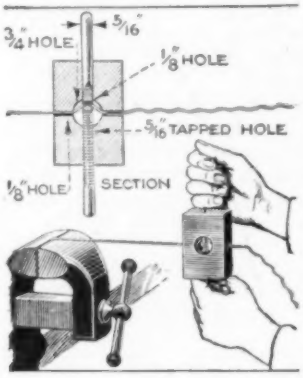


then run down until the screwdriver point engages the slot and drives the screw home. In this manner the ends are readily forced together, and when the screw projects through the bottom lug, the nut is slipped in place, the final tightening being done with a wrench after the tool has been removed.

A Good Wire Straightener

The making of an odd coil spring or two, in the small shop, is always more or less of an experiment, and often several springs must be wound before one suitable for the purpose intended is made. The tool shown in the illustration has been successfully used for straightening these scrap springs, to reclaim the wire for future use.

A rectangular piece of ½-in. steel is used for the body. A ¾-in. hole is drilled in the center; a ⅛-in. hole in each side, for the wire; a 5/16-in. plain hole in one end, and a 5/16-in. tapping hole in the other, as shown. The plain hole is fitted with a sliding handle, with a ⅛-in. hole drilled through it near one end, and a threaded 5/16-in. rod is screwed into the tapped hole.



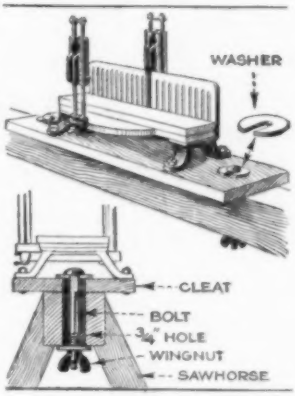
To straighten out a spring, one end is held tightly in a vise; the other end is gripped in a pair of pliers, and the spring pulled out until the wire is as straight as possible. The handles of the tool are then adjusted until the hole in the end of the plain handle is in line with the ⅛-in. holes in the body, and the tool is pushed onto the wire and up to the vise.

The threaded handle is then screwed in, until sufficient tension is put on the wire to straighten it, when the tool is drawn along as shown. To prevent the plain handle from falling out when the tool is not in use, a few punch marks may be made around the inner end, or a piece of wire put through the hole and the threaded handle screwed tight.

The edges of the holes are rounded to allow the tool to slide on the wire without cutting or scraping it.

Quick-Acting Miter-Box Clamps

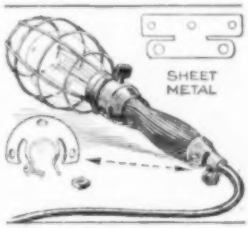
The carpenter's usual method of attaching his miter box to a sawhorse has several disadvantages. It is generally necessary to nail cleats across the top of the sawhorse to provide a base wide enough for the legs of the miter box, which, in turn, must be screwed or nailed to the cleats.



A better method was devised by a California carpenter, and is shown in the drawing. The miter box is screwed or bolted permanently on a board or cleat, and the cleat is clamped to the sawhorse by means of two carriage bolts, slipped through ¾-in. holes drilled in both cleat and sawhorse. A slotted washer is slipped under the bolt head when the bolt is pushed in position from below, and the wingnut on each bolt tightened, clamping the miter box securely on the horse. To remove the miter box, it is only necessary to loosen the wingnuts so that the washers can be slipped out, and the bolts will drop out.

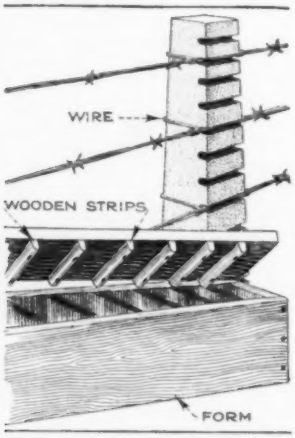
Clamp Protects Portable-Lamp Connections

Trouble is usually experienced with electric extension cords fitted with portable lamps of the type illustrated, as the cord is easily pulled out of the socket. This trouble can be overcome by fitting the lamp handle with a small sheet-metal clamp, the upper detail showing the pattern of the clamp and the lower detail how it is bent. A small bolt is fitted on the clamp proper, so that it can be tightened on the lamp cord. The other part is screwed to the end of the handle as indicated. With this in place, the part of the cord inside of the lamp holder will not be subjected to any strain.



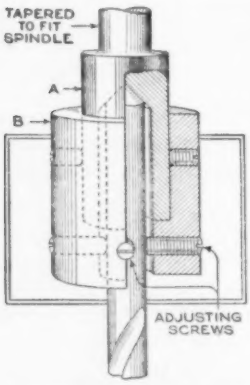
Attaching Wire to Concrete Posts

A good method of attaching wire to concrete fence posts is shown in the drawing. One side of the post, as far as it extends above the ground, has small grooves formed in it, about 2 in. apart. These grooves are made by wooden strips nailed to the face of the form in which the posts are made. The fence wire is laid in the grooves as shown, and bound in place by a short length of wire, passed around the post and twisted around the fence wire.—Warner H. Ellis, Keenes, Ill.



A Milling-Machine Drill Chuck

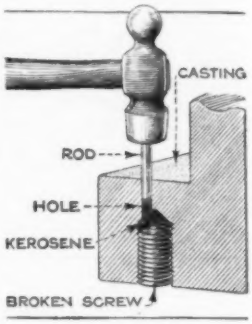
In order to line up the point of a drill to a punch mark on the work held on the table of a machine, it is, of course, necessary that the drill should run true. To obtain this accuracy, something more than the ordinary drill chuck is needed, for drills have a habit of running true in the shank but out at the point. This may be the fault of the drill, but is more often the fault of the chuck, which, unless it is a new one, has a tendency to throw the drill point slightly out. To overcome this, the drill chuck shown was designed.



It is made in two pieces, the part A being turned to fit the spindle and bored out with a conical seat at the bottom. The sleeve B is bored at one end to slip over the inner piece, the opposite end being bored to the same size as the opening in A. The outer piece is bored and tapped to take four screws for truing purposes, and two setscrews to hold it to the shank. As shown in the drawing, several different drill sizes can be held in the holder. In operation, the drill is pushed into the chuck until it rests in the conical seat provided for it, and the four adjusting screws are tightened to line up the drill approximately, after which the drill can be trued up as accurately as desired by loosening or tightening the screws after the manner of a four-jawed chuck.

Removing a Broken Screw

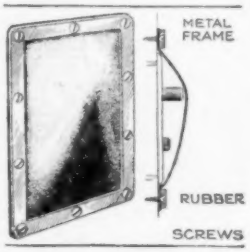
The removal of a broken stud or set-screw, that has rusted in place, usually requires considerable time and patience. Before resorting to annealing and drilling, the method shown in the drawing should be tried, if possible.



Invert the piece in which the screw is situated, and drill a small hole into the screw hole, as shown in the illustration. Fill this hole with kerosene and insert a short rod of the same size as the hole. By hitting the rod a hard blow, the kerosene will be forced around the threads, after which it is easy to remove the screw with a hammer and chisel.

Making Push-Button Switches Water-Tight

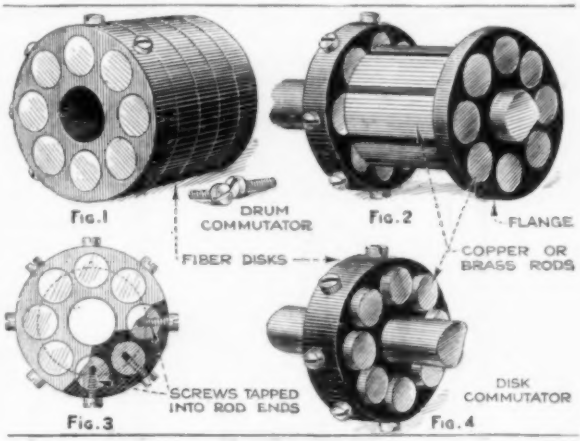
Push-button switches in exposed places can be protected from water by covering them with rubber, attached as shown in the illustration. For a single-gang switch, a rubber sheet, about 4 or 5 in. in dimensions, should be used. Such a piece can be cut from an old inner tube. The rubber is attached to the wall around the switch by means of a narrow frame, cut from a piece of sheet brass, and drilled to receive small brass screws. A snap switch can be protected in the same way, except that a larger sheet of rubber is required, to allow the knob to be grasped and turned.



Making Small Commutators

Drum commutators for small experimental motors and dynamos are usually made by driving a length of brass tubing over a fiber rod, fastening the ends with machine screws, and then cutting the tubing lengthwise into segments. A better method is to make up a fiber body, considerably larger in diameter than the finished commutator, by pressing together a number of thick fiber disks on a mandrel, the same size as the motor or dynamo shaft. Copper or brass rods are then driven into holes drilled lengthwise through the fiber cylinder, as shown in Fig. 1. The whole cylinder is turned down until the rods have been cut away to about half their diameter, as in Fig. 2, leaving a series of segments, separated by the fiber insulation, with a flange at each end. The diameter of the rods used for the segments is determined to a great extent by the number of segments necessary; the larger the number of segments the smaller the rods. Before turning down, each rod is drilled and tapped, through the fiber, at one end, and small brass machine screws are screwed in, to hold the rods in place, and to serve as terminal fasteners for the armature winding, as shown in Fig. 3.

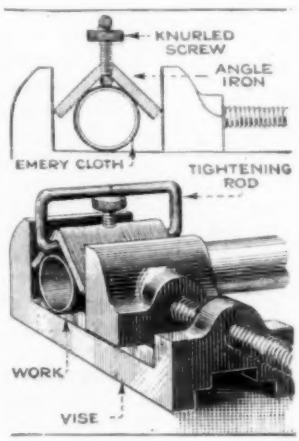
A disk-type commutator can be made in a similar manner and with less work. In this case the segments are round copper or brass plugs, turned down for a portion of their length, and driven into holes drilled in a fiber disk as shown in Fig. 4; brass screws are used in this type also, to hold the plugs in place.



Figures 1, 2, and 3, Drum Commutator, and Figure 4, Disk Commutator, Made of Fiber Disks and Copper Rods

Holding Thin Tubes in Hacksaw Vise

Sawing thin tubing in the power hacksaw is always an awkward and time-consuming job, as the material must be gripped tightly enough to prevent moving, yet without distorting it. The device shown in the drawing will simplify the work considerably, and will more than pay for the time spent in making it, whether this job be a "stock" one, or only done from time to time. A piece of angle iron, rather shorter than the width of the vise jaws, is used for the body, and is drilled and tapped, at its center, for a knurled-head screw. Next a length of small, round, cold-rolled steel is bent to form a rectangle, the length of which is sufficient to allow it to slip over the angle iron, while the width is a little more than the length of the knurled screw.



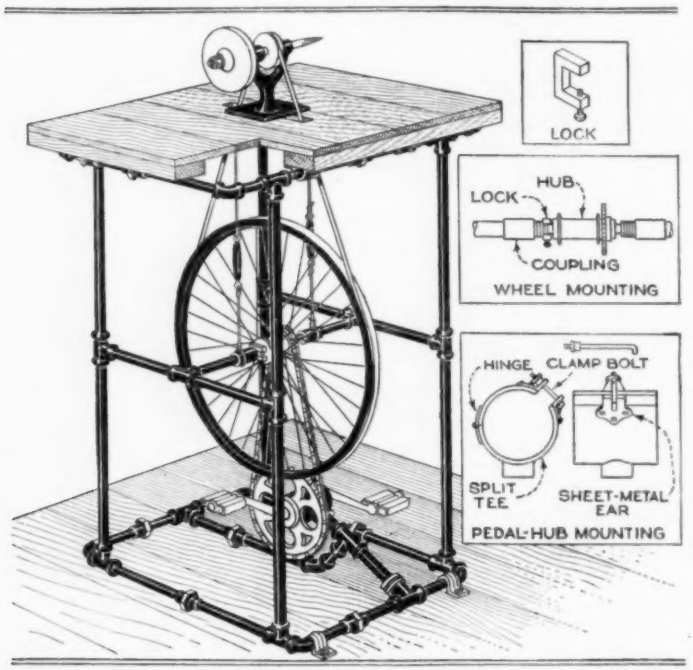
The method of using the device is as follows: The tube is first wrapped, the length of the angle iron, with emery cloth, folded back to back, so that the emery is on both surfaces. Then, with the screw backed out, so that the rod lies snugly against the iron, the angle iron is pressed down tightly on the tube, and the vise is closed on the iron. The tube is now held snugly without the pressure of the vise acting directly on it. To keep it from moving under the saw, the screw is tightened.

It is not necessary to loosen the vise each time the tube is moved forward, releasing the pressure on the rod sufficing to enable the tube to be moved. When the holder is not in use, the screw is backed up against the rod.—Harry Moore, Montreal, Can.

Foot-Power Grinder for Small Shop

BY C. RABER

A FOOT-POWER polisher and grinder that can be used for sawing, and for driving a small lathe, as well as for grinding, in a small workshop, is shown in the illustration. The easy running of the machine, and the convenience of the pedal arrangement, enable the operator to use both hands for the work.



A Foot-Power Grinder Used in a Small Workshop: It is Also Used as a Buffing Wheel, a Circular Saw, or to Drive a Lathe

The frame is constructed entirely of pipe and fittings, and the driving mechanism of bicycle parts. The pedal-hub mounting consists of a regular bicycle-pedal hub, held securely in a large tee, which is split and fitted with a hinge and clamp as shown in the lower detail. Crosspieces in the center of the framework hold the wheel in position so that the small sprocket on the wheel hub is in line with the large pedal sprocket. The method of mounting the hub is shown in the center detail. The ends of the spindle are carried in nipples on each side, and the lock shown in the upper detail is used to prevent the cone from being tightened by the wheel when the latter is turning. As the greatest strain to which this part is subjected is downward, supporting wires, fitted with turnbuckles, are connected to the pipe couplings and to the underside of the table, as shown.

The table consists of a frame, made of 2 by 4-in. stuff, to which a ½-in. top is nailed. The grinder head is bolted or screwed to the top so that a small V-pulley, mounted on its shaft, is exactly in line with the bicycle wheel. A belt is then passed over these two wheels, and the grinder is complete. The top should be securely attached to the frame, and the frame to the floor, by means of pipe straps.

Copying Newspaper Halftones

Many good photographers fail to get successful results when trying to copy pictures in newspapers or magazines. Success is assured if the directions given below are closely followed.

Place a piece of ground glass in a printing frame, ground side up. On this, lay a thin piece of clear celluloid and place the picture face down upon it. Fasten the back of the frame, and stand it on a table squarely in front of the camera. Illuminate the picture from the front, to avoid reflections, but do not let the light shine into the lens.

Use a "process" plate, not the ordinary kind; this is slower in action, hence an exposure of about double the usual time must be made. Focus carefully and do not shake the camera during exposure.

The ground glass will eliminate the grain of the halftone and paper entirely. If the halftone screen is a very coarse one, it will be found better to reverse the glass, thus placing the ground side farther away from the face of the picture.

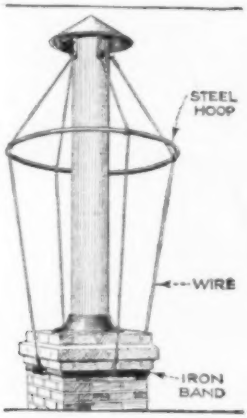
¶When examining the storage battery of a car to see if any water is needed, do not simply test one cell; examine them all. One of the cells may be cracked, and will require water oftener than the others. It is a good idea to examine a storage battery once every two weeks. In adding distilled water to the battery, always bring the level of the electrolyte ½ in. above the top of the plates.

Homemade Metal Lath

By using homemade metal lath on an outside stucco job, a considerable saving was effected. The price asked for regular metal lath by dealers was about 38 cents per square yard, while the homemade kind cost about 10 cents. Lengths of No. 8 galvanized wire were first tightly stretched over the wall vertically, spaced about 10 in. apart, and nailed at both ends; 2-in. mesh poultry netting was tacked over this, then lengths of No. 18 wire were laid horizontally, spaced about 4 in. apart, and nailed at the ends. The whole was stapled down well and the cement was applied in the usual way. —A. L. Neuenschwander, Miami, Fla.

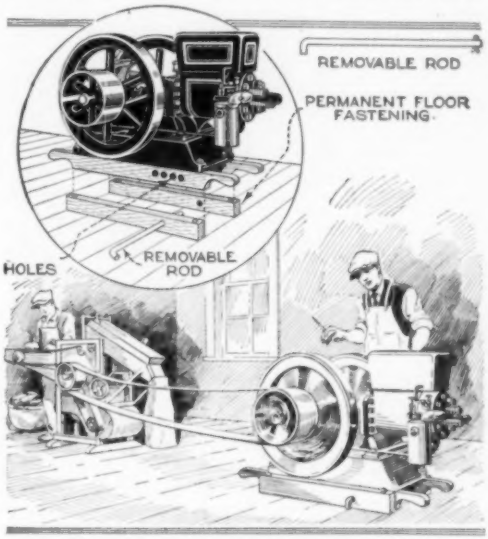
Bracing Chimney Extension

A tinsmith who was confronted with the problem of erecting an extension on a low chimney, without attaching guy wires to the roof, braced the extension in the manner shown in the drawing. An iron band was bolted around the chimney as indicated, and stovebolts were fitted in holes drilled on each side, for the guy wires. The latter were fastened to the top of the chimney extension and to the stovebolts, and were spread apart by means of a steel hoop, which was held in position by wrapping each guy wire around it once. This bracing made the extension so strong that it has withstood the heaviest gales.



Making the Farm Engine More Convenient

The problem of holding down a gasoline engine, without resorting to the usual method of bolting it to the floor, was solved by the portable and adjustable base shown in the drawing. Two heavy wooden beams are bolted to the underside of the engine, their ends projecting far enough to be used as handles. Two similar beams, somewhat shorter, are permanently attached to the floor so that those on the engine will fit between them. A removable rod is then pushed through holes drilled in all four beams, to lock them together and hold the engine down securely. One hole is drilled through each outside beam and a series of holes through the inner ones so that the two



A Base That Makes the Farm Engine Readily Portable, Yet Secure When in Use

base members can be locked together at different points, to obtain proper belt tension. Floor beams of the same type are attached near every engine-driven machine, so that, to attach the engine, it is only necessary to slide it into place and slip in the rod.

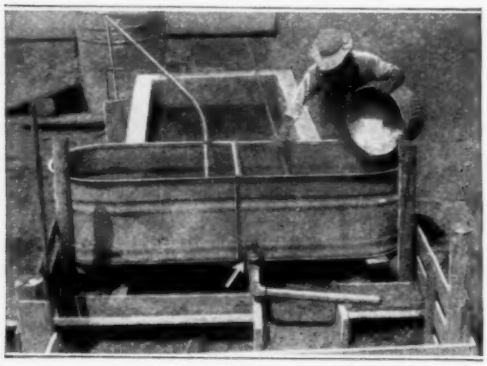
Flatiron Coil Used in Ignition System

A Wisconsin flour miller eliminated the use of dry cells for low-tension ignition on his stationary gas engine by substituting a flatiron heating element. By so doing he also avoided the expense of renewing the cells, which is incident to dry-cell ignition systems. The flatiron coil was connected in series with the 110-volt lighting circuit and the ignition circuit of the engine, on the positive side. The coil was suspended in the air, where it could not come in contact with any inflammable substance, as it became very hot when used for any length of time. Although a good, hot spark was provided with this arrangement, there was only a small current consumption, and there was nothing to get out of order easily.—Paul L. Fetherston, Jackson, Michigan.

Mixing Feed for Hogs

The novel method of slopping hogs shown in the photo is in use on an Iowa farm, and has been found a great time and labor saver.

The iron tank shown in the foreground



A Novel Method of Slopping Hogs: Both Troughs can be Refilled While the Hogs are Feeding

is placed at one end of the concrete watering trough, and can be filled with water from the pipe that supplies the trough. The tankage, shorts, or other ground feeds are mixed in the tank and enough water run in to make a thin slop. Then the valve indicated by the arrow is opened, and one of the troughs filled, whereupon the valve is closed again, the pipe swung over to the other trough, and this one filled. The valve and tank, and the inner ends of the troughs, are fenced in as shown, so that the hogs will not interfere with the filling operation, and the hogs are not turned into the yard until both troughs are filled, so that each one has an equal chance to get its portion of the feed.

Lubricating Derrick Sheaves

It is almost impossible to get the average derrick operator to oil the sheaves at the top of the derrick, as it is necessary to climb the mast. On an 80-ft. derrick we overcame this difficulty by running a ¼-in. pipe along the mast to within a few feet of the top, and fitting a length of flexible metallic hose on the end to reach the center pin of the sheave. Metallic hose comes in sizes appropriate for this purpose, together with the necessary fittings, which are a solder nipple on one end and a ¼-in. pipe-thread nipple at the other. At the bottom of the length of pipe, an elbow, taken from one of the popular high-pressure auto-greasing systems, was fitted. A good grade of grease, that does not harden in cold weather, was used, the entire pipe being filled with grease by means of the high-pressure grease gun, so that at any time afterward, a push on the grease gun below forced the grease into the sheave pin. This method of lubricating has also been found practicable on all our clamshell buckets, and on the derrick engine. In places where the nipple was likely to be broken off, the old oil cup on the bearing was removed, and a solid plug was substituted for it. Another plug of the same size was drilled and tapped to take one of the grease nipples. When it was necessary to oil the bearing, the solid plug was removed, the one with the nipple screwed on, and the grease gun applied.—A. S. Jamieson, Springfield, Mass.

Enameled Ware Repaired by Brazing

Enameled ware can be repaired easily and permanently by brazing, the small tip of an ordinary welding or acetylene brazing torch being the most suitable to do the work. Remove all rust and dirt around the hole with hydrochloric acid, or with a piece of emery cloth. Apply heat, and melt the flux and spelter around the hole, spreading the spelter over the hole with an iron wire, flattened on one end. The spelter will unite with the enamel, making a permanent repair.—M. Van Slyke, Jacksonville, Fla.

A Handy Spike-Pulling Tool

It is frequently necessary to tap or remove spikes and other parts so close to the ground that there is not enough room below for the head of the hammer, to say nothing of the space required for swinging it. The tool illustrated will prove of considerable assistance in cases of this kind. The lower hook is inserted beneath the head of the spike to be drawn, and the hammering is done on the underside of the upper hook.—H. J. Engel, New Braunfels, Tex.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Making a Cycling Monkey

BY L. R. BUTCHER

A FEW ordinary tools and a little skill are all that is required to enable any boy to make the animated toy shown in the illustration; this will not only make a splendid toy for little brother or sister, but any boy, or group of boys, can make a sufficient number to earn quite a little pocket money, if the work is well done and attractively finished.

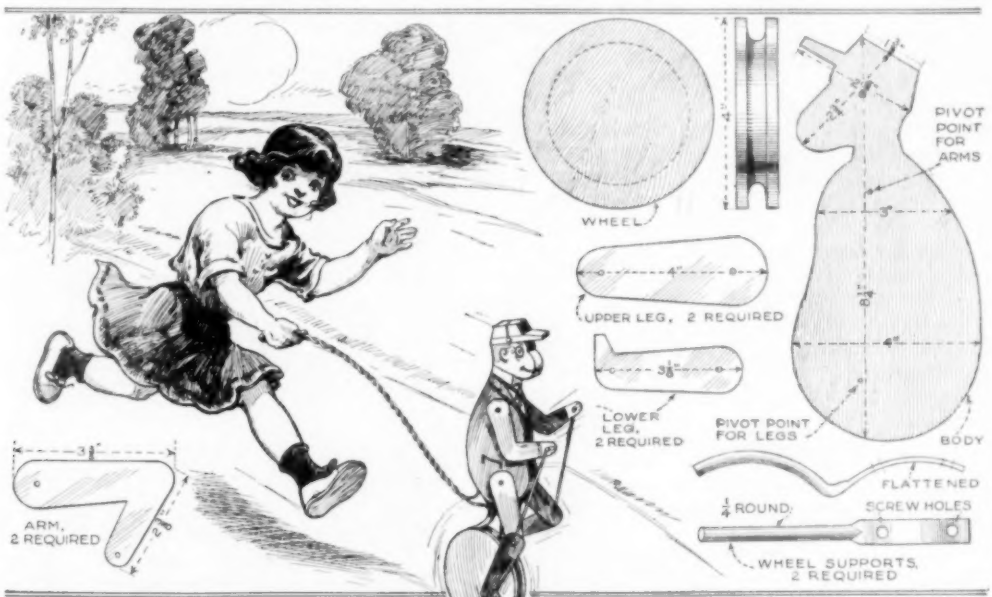
Any good soft wood, 1 in. thick, and free from knots or other imperfections, can be used for the body. A vertical center line should be marked on the stock first, and all measurements for laying out the body made from this line. It is not at all necessary to follow these dimensions closely; the body can be made as much larger or smaller as desired, while keeping to the same general proportions.

Each arm is made in one piece, each leg in two, 20-gauge sheet metal being used. Blue-annealed sheet steel is better for this purpose than galvanized iron, which does not hold paint well. Almost any kind of scrap metal can be used—strips cut from an old auto body, for example, are excellent for the purpose.

The wheel may either be made from one piece, 1 in. thick, or built up; the one-piece construction is the stronger, and should be used whenever possible. This is a wood-lathe job, but if no lathe is available, any woodworker will turn one out at very slight cost. The groove around the wheel accommodates the wheel supports; there is no axle.

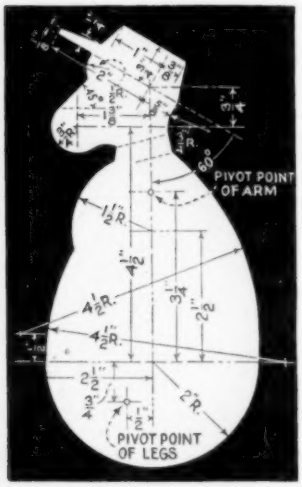
Round iron or cold-rolled steel, ¼ in. in diameter, is used for the wheel supports. One end of each support is flattened and drilled for screws for attachment to the body, the remainder being curved to fit in the wheel groove.

The toy is assembled by first fastening



An Ingenious and Almost Unbreakable Toy That will Please Any Child: Nothing but Common Wood and Sheet-Metal Working Tools Are Necessary for Its Construction

the wheel in place, allowing a slight play between wheel and supports. The wheel should be placed a little in front of the center line of the body. The lower ends of the legs are then pivoted to screws driven into the wheel at a distance of 1¼ in. from the center, so that, when one leg is extended, the other is raised.

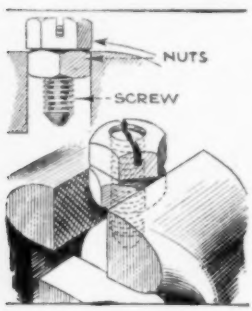


Ordinary tinners' rivets are used as pivots for the knee joints, and screws at the points where the legs and arms are attached to the body. The end of each arm is linked, by a short piece of wire with an eye bent at each end, to the knee joint, causing the arms to move up and down as the toy is pushed forward. Two pieces of heavy wire, twisted together and attached to the rear of the body, form the tail and the handle to push the toy.

The maker may use his own taste in painting the toy, but whatever color scheme he decides to follow, the face should be strongly marked. The completed toy is very sturdy, in fact almost unbreakable, and will please any child.

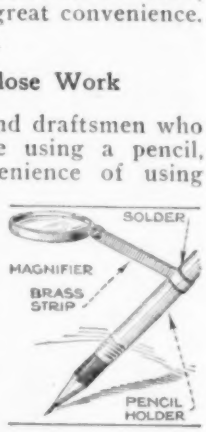
Making Headless Setscrews

Headless setscrews can be made by the amateur mechanic by cutting off the heads of machine screws or capscrews, and cutting the slots with a hacksaw, but, unless some method of guiding the saw is used, it is difficult to make a neat job, especially in the smaller sizes. A fixture that eliminates this difficulty consists of a nut fitting the screw to be slotted, and having a slot cut across it to a depth about twice that of the desired slot in the screw. After cutting the slot in the nut, it is hardened. In use, another nut is first run onto the screw; the slotted one is then screwed down against the first, and tightened, the screw head coming about the center of the slot, and the nuts are then gripped in a vise, as indicated. A number of these fixtures, made for various sizes of screws, will be found to be of great convenience.



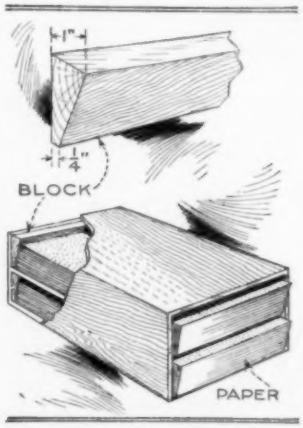
Magnifier for Close Work

Retouchers, artists, and draftsmen who need a magnifier while using a pencil, will avoid the inconvenience of using both hands by making the simple attachment shown in the drawing. Solder a short strip of brass to a pencil holder, or to a metal lead holder. Obtain a small high-power magnifying glass, and attach it to the brass strip by means of a screw, to allow adjustment. The result is a complete tool that can be held in one hand, the magnifier always being in focus for the work.



Improving Stationery Cabinet

Small stationery cabinets, used on many desks for holding typewriter and carbon-copy sheets, can be improved considerably by gluing a beveled strip of wood to the inside of the back, in each compartment, as illustrated. This makes the top sheet of the paper project a trifle beyond the sheet below and so on, which enables one to pick up single sheets without loss of time and without crumpling the paper. The wooden strips should, of course, be just wide and long enough to fit the compartments neatly.—Dale R. Van Horn, Walton, Neb.



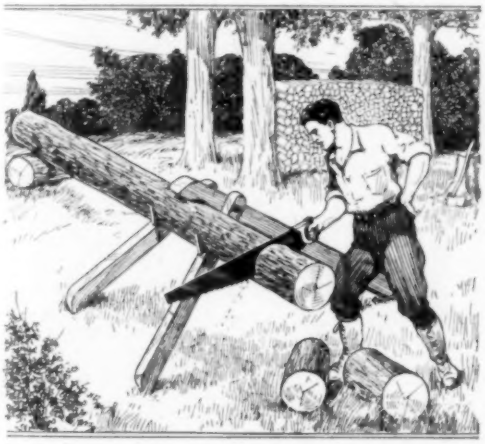
Renewing Scent of Cedar Chest

Moth balls or other highly odorous substances destroy the natural sweet scent of a cedar chest if used in it for any length of time, and they then seem to impregnate the wood with their own peculiar odor, which is very difficult to remove.

I have found that about the only way to remove these odors, and to restore the original cedar-wood smell, is to sandpaper the entire inside. In doing this the sandpaper is rubbed across the grain. It is advisable first to use a coarse grade of sandpaper, and if this leaves the surface too rough, to use a finer grade afterward. The treatment is effective on a very old cedar chest.—Rufus E. Deering, Clements, Kan.

Simple Jack for Cordwood

When sawing cordwood, it is usually found inconvenient to hold both wood and saw, especially when the lengths become short. This difficulty can be avoided by using a simple jack of the



A Simple Jack for Holding Cordwood: It Automatically Clamps the Wood to Facilitate Sawing

type illustrated. It consists of three heavy beams, pivoted together on a bolt near one end. The two outside beams are swung out in one direction and the central one, which is cut out to fit the logs, in the opposite direction, as indicated. Pins, driven into the outer beams, hold the cordwood up, and the upper end of the center beam clamps it down securely. By pushing the center beam in, the log may be slid along for another cut. As soon as the beam is released, the piece is again automatically clamped.

A Clothes Rack for the Closet

The capacity of a clothes closet can, in many cases, be doubled by the addition of the rack illustrated. A triangular

A Clothes Rack That can be Hoisted Out of the Way Increases the Capacity of the Closet

frame made of 1-in. material is provided with clothes hooks and suspended from the ceiling by means of a length of rope, strung over two pulleys screwed into the ceiling, one in the center and the other near the side. This rope is attached to smaller ones running to the sides of the frame. The latter is held at any desired height by hitching the lifting rope to a clothes hook or nail driven into the side wall. A knot is tied in the rope at such a point that it will stop at the first pulley and hold the rack in a position where the hooks can easily be reached from below.—Paul L. Fetherston, Jackson, Mich.

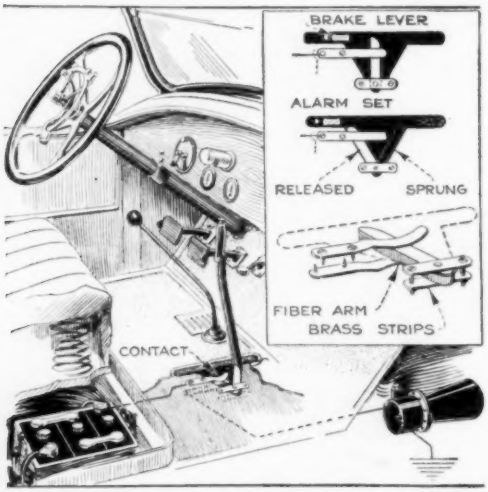
Removing Headlamp Rims

When it becomes necessary to remove automobile headlamp rims, it will frequently be found that they are so rusted that they cannot readily be turned by hand. This is due to the fact that insufficient "grip" is obtained because of the high polish of the nickel or enamel.

Before applying tools, which may mar the finish of the rims, apply a strip of friction tape around the entire outer edge, and try again. In most cases the rim will readily come off. After the rim has been replaced, the tape is removed, and the adhesive cleaned from the nickel or enamel surface with gasoline.—Geo. F. Aring, Dayton, Ohio.

Theft Alarm Safeguards Car

The drawing shows a simple theft alarm that can be attached to any car, and will, when set, sound the horn and keep it



An Easily Made Theft Alarm That Sounds the Horn When the Emergency Brake is Released

sounding, the moment the emergency brake is released. It consists of a switch having two spring-contact blades located in a V-shaped slot, cut in the floorboard at right angles to the brake-lever slot, and a movable fiber arm that is pushed between the ends of the blades, after the brake lever is pulled back, so that the lever cannot be moved forward without dislodging the arm and closing the switch. When the owner uses the car, he pulls the arm back, so that the brake lever may be moved past without disturbing it. This circuit, of course, is independent of the regular horn circuit.

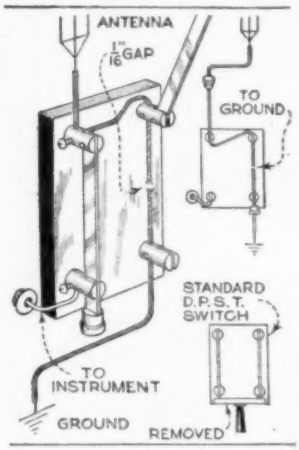
Cleaning Light Silk Fabrics

Georgette crêpes, crêpe de Chine, silk pongee, and other light silk fabrics that will not stand washing, are frequently dry-cleaned at home by washing in gasoline. If the soiled spots are caused by grease, oil, or other substances that are soluble in gasoline, this method is perfectly satisfactory. But when spots of sugar, candy, and ice cream are to be dealt with, as is frequently the case, gasoline cleaning alone will not suffice. Water must be used, but not without caution, for, when applied directly to the fabric, rings and discolorations are likely to result.

A method now practiced by many experienced cleaners can be imitated at home, and the garments can be cleaned without injury, if the following directions are carefully followed. Wash the garment carefully in gasoline as usual, then rinse in clean gasoline, and, without wringing, dip two or three times into a pail of clear soft water, to which has been added 3 or 4 oz. of vinegar. Remove quickly, shake out the surplus water, and hang the garment where it will dry in a short time. Do not allow heavy folds to form in the fabric, as the moisture will be retained in these too long. If hung on a line out of doors, where the wind will aid in drying, so much the better. The evaporating gasoline will carry with it the moisture.

Improvised Ground Switch

An antenna should not be hooked up without a ground switch just because there is no single-pole double-throw switch at hand. A 100-ampere, or larger, double-pole single-throw switch will do quite as well. The only change necessary is the removal of the handle and the insulating crossbar, and the fitting of individual knobs or handles to each blade, so that they can be thrown independently; composition caps of large binding posts are suitable for this purpose. To connect the switch in the circuit, the bared end of the lead-in wire is threaded through both pivot terminals. The ground lead is brought through the bottom post opposite the free end of the lead-in wire and is extended toward the latter as shown, allowing a 1/16-in. gap between the ends. This makes a good safety gap that will not interfere with incoming signals. The wire leading to the instruments is fastened to the remaining post, as shown. When receiving, the grounding blade is thrown open and the other closed; when idle, the positions of the blades are reversed.—E. J. Bachman, Fullerton, Pa.

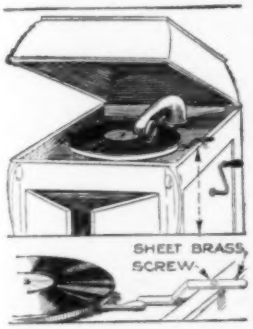


Protecting Cucumbers from Beetles

City gardeners who have but a few hills of cucumber, watermelon, or muskmelon vines that are preyed upon by striped beetles, will find that a few moth balls, broken in small pieces and scattered around the plants, persuade the assailants to retreat to other regions.—C. M. Wilcox, Torrington, Conn.

Convenient Stop Lever for Phonograph

The phonograph stop lever illustrated can be operated when the top is down, eliminating the necessity of raising the top when no more records are to be played. The lever consists of a brass strip, about ¼ in. wide and 6 in. long, bent to the shape shown. It is pivoted on a small screw driven into the edge of the cabinet at the point indicated, one end of the lever projecting outside the cabinet, and the other end resting against the trip that stops the machine, so that when the lever is pushed the trip is operated. The lever, if made of brass, can be given a fine finish by heating, and then dipping into nitric acid (poison).

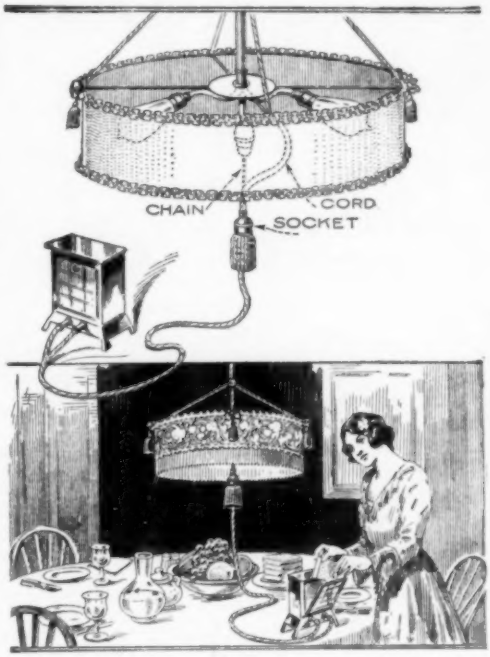


Mason Jar Used as Sap Bucket

Ordinary mason jars can be used to collect the sap when tapping maple trees, with the arrangement shown in the illustration. A bail to hold the jar is made of No. 8 galvanized-iron wire. This is made to fit inside the jar, and to spring outward against the neck as indicated. The bail is hung on the "tap" in the same manner as a regular sap bucket, notches being cut in the tap to prevent the bail from slipping off.—Harold Jackson, Kankakee, Ill.

Combined Tassel and Socket

Many women are making attractive silk light shades for the dining room, to be hung over the table instead of a glass



Convenient Method of Attaching an Extension Cord to a Lighting Fixture Having a Silk Shade

dome. It is desirable to have the bottom of these shades closed, but it then becomes a difficult matter to connect the extension cord of an electric appliance on the table unless the cord is run over the side of the fixture. This difficulty can, however, be overcome by letting through the center of the bottom a short length of portière cord, carrying within it an equal length of lamp cord, connected to one of the sockets inside. A socket, covered with a tassel to match the portière cord, is attached to the lower end of the lamp cord.

In cases where a pull-chain switch is used to control the fixture, the portière cord may be attached to it as shown in the upper detail, so that the tassel will then serve two purposes.—Ellis Levy, New York City.

¶The most convenient place for a hand-operated horn on a truck is underneath the floorboards, so that it can be worked with the foot. An opening is cut in the boards so that the plunger will project above the floor.

BUILDING A CAMP CAR

By Ray F. Kuns
PRINCIPAL, AUTOMOTIVE TRADE SCHOOL, CINCINNATI, OHIO

Part II
Interior Fittings

HAVING built and covered the frame, as detailed in the July issue, the construction of the berths and other interior fittings may be taken up.

At the front of the car, in Fig. 11, will be seen a duck-covered frame; this serves several purposes. When the car is closed up, ready for traveling, the back end of the frame rests on the top of the windshield, as shown in Fig. 13, protecting the berth from dust and dirt. When the berth is down, the frame forms the front wall of the sleeping recess. The frame is made of 1 by 4-in. poplar, and is hinged to a stout cleat in the "nose" of the car. The hinges are firmly bolted to both frame and cleat, as they carry part of the weight of the berth and its occupants. The immediate point that receives the weight of the berth is a cleat running across the frame, as shown in section in Fig. 13; and to keep the berth from slipping from this cleat, two iron brackets, shown dotted, are screwed to it, and fit behind the berth frame. Most of the weight of the berth is carried by the cross member of the truss, shown, in Fig. 13, just below the windshield.

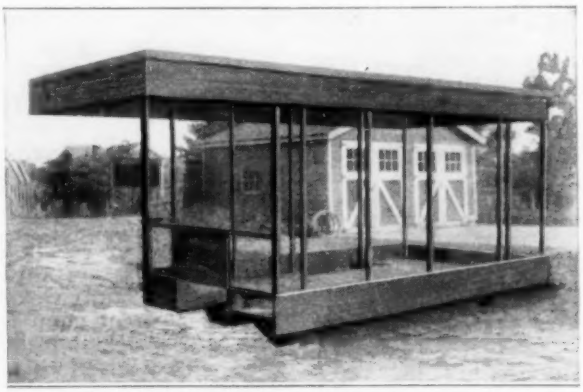


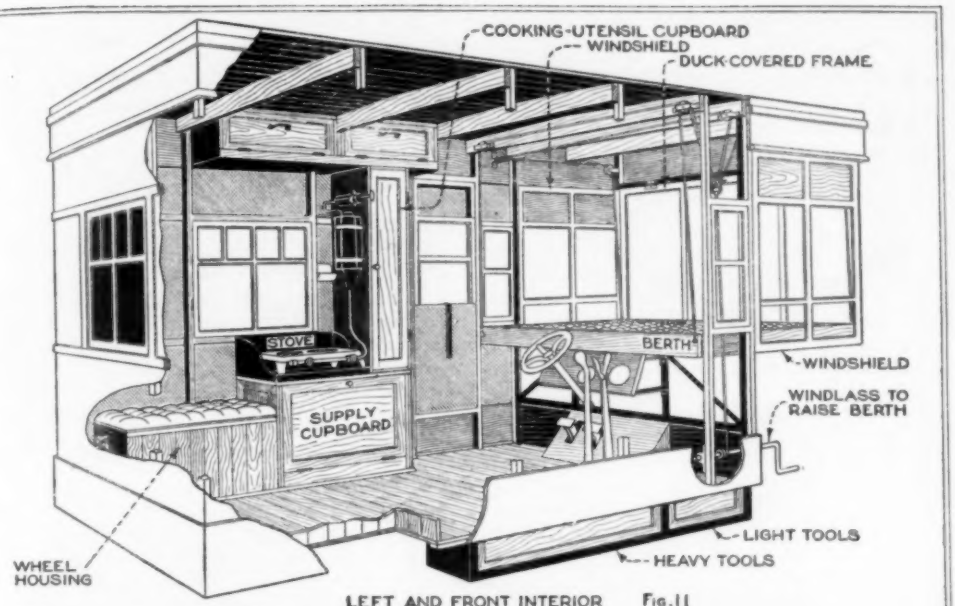
Photo Showing Body Framed, Ready for the Application of the Duck Covering

The duck used to cover the frame need not run below the cleat just mentioned. The side rails project below this, and form convenient handles for lifting the frame. A grooved rail on the front of the frame fits over the top of the windshield when the car is closed.

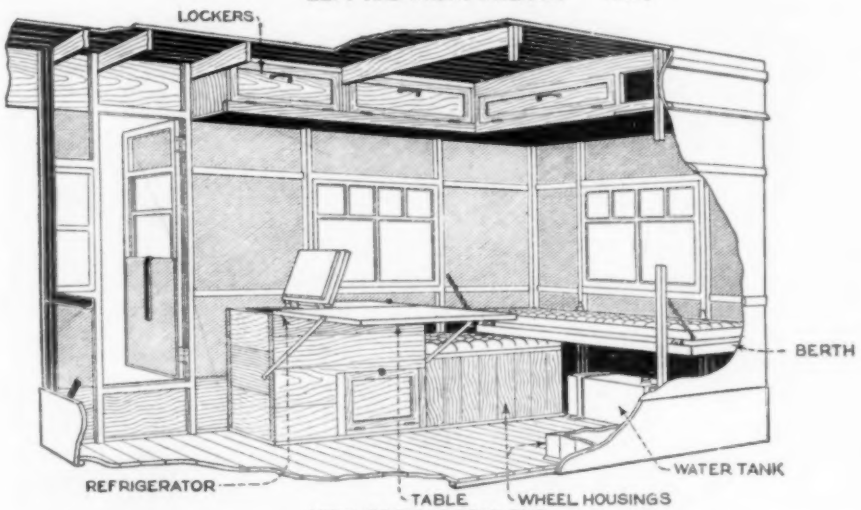
The front berth, shown in Fig. 14, is made from a discarded bedspring, the end angle irons of the bed being screwed or bolted to the endpieces of a 48 by 72-in. wooden frame. The endpieces of the frame cover the ends of the sidepieces, to prevent trouble due to the pull of the springs. The bottom of the berth is covered with duck, which may be paneled with lattice strips if desired.

The windlass-and-pulley arrangement for raising the berth is shown in Figs. 11 and 13. The pulleys are so placed that the small ropes running to the corners of the berth may be attached to a larger rope, which is run to the windlass. The latter is a length of ½-in. pipe, mounted in wooden blocks on the frame, and provided with a gear and dog for a ratchet. The pipe projects through the front panel board, and a crank, fitted with a pin that engages slots cut in the pipe, is used to turn it. The crank is stored in the car when not in use. The gear is pinned to the pipe just inside the front post, and the pawl fastened to the post so that it will prevent the gear from turning backward, except when the pawl is raised. The ropes used at the four corners are medium-weight sash cord; the windlass rope is of the same type, but heavier.

The rear berth, shown installed in Fig. 12 and in detail in Fig. 15, is made from



LEFT AND FRONT INTERIOR Fig. 11



VIEW OF RIGHT REAR END

Fig. 12

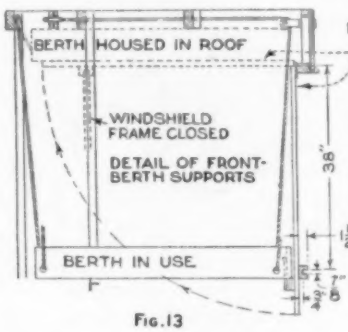
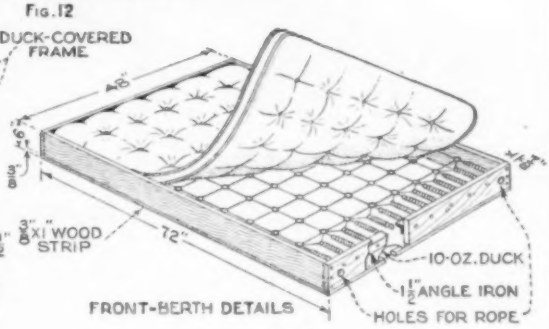


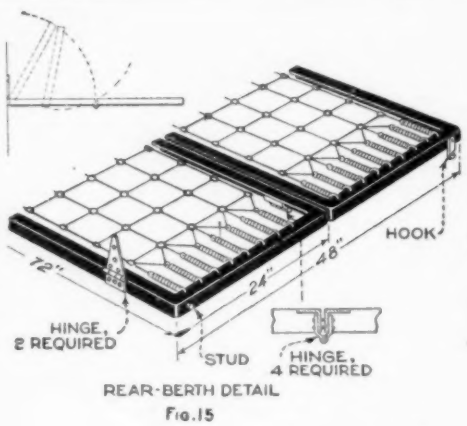
Fig. 13



FRONT-BERTH DETAILS

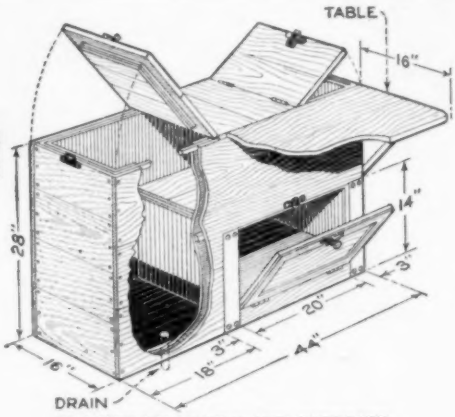
Fig. 14

Figure 11, View of Left and Front Interior, Showing Location of Utensil and Supply Cupboards, Gasoline Stove, and Front Berth; Figure 12, View of Right Rear End, Showing Lockers, Rear Berth, and Refrigerator; Figure 13, Details of Front-Berth Arrangement; Figure 14, Working Drawing of Front Berth



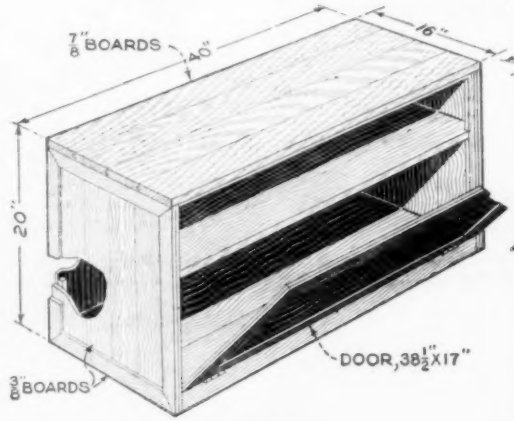
REAR-BERTH DETAIL

Fig. 15



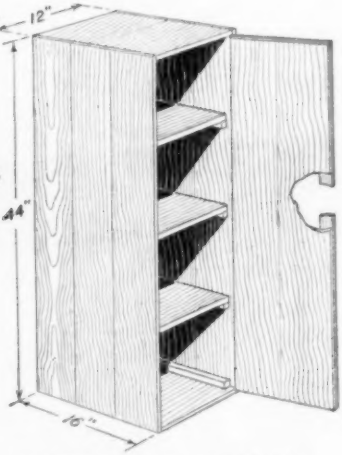
REFRIGERATOR, TABLE, AND CUPBOARD

Fig. 16



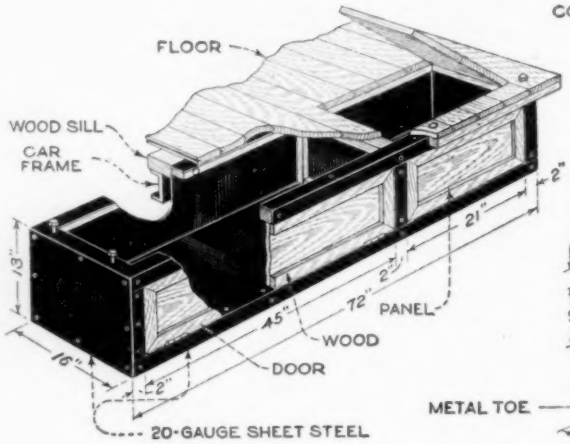
SUPPLY CUPBOARD

Fig. 17



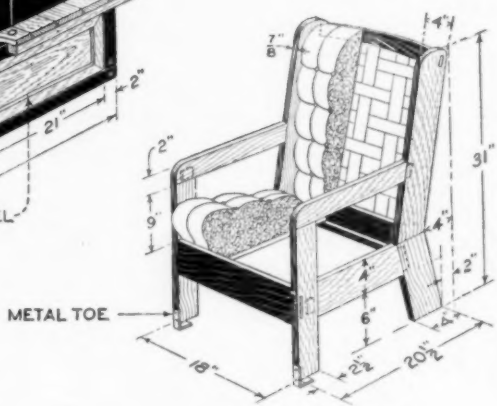
COOKING-UTENSIL CUPBOARD

Fig. 18



DETAIL OF TOOL BOX

Fig. 19



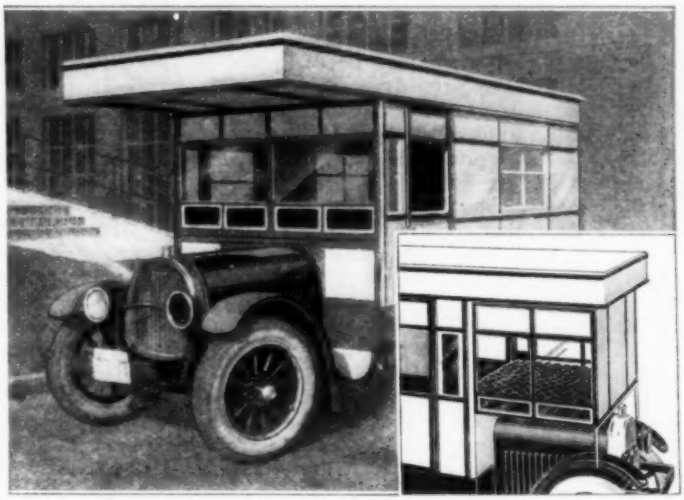
CHAIR, 4 REQUIRED

Fig. 20

Figure 15, Details of Rear Berth; Figure 16, Construction of Refrigerator and Table; Figures 17 and 18, Supply and Cooking-Utensil Cupboard Details; Figure 19, Method of Making Tool Box; Figure 20, Framing and Upholstering of Chair, Showing Method of Fastening Chair to Floor

a so-called sanitary couch. All parts are discarded except those that can be used to make up the two light 2 by 6-ft. frames. After the frame pieces were cut to size they were welded together, although riveting will serve just as well. The springs were then fitted into each section, and the frames fastened together by means of four hinges, as shown in the detail. Two other heavy strap hinges were fastened to the berth and to the rear posts, as indicated, and hooks and studs fitted to secure the two parts together when folded against the wall, or when used at half width. The method of folding is shown in the upper detail. The half mattresses used are fastened to the frames by means of heavy cord. Two heavy chains, attached to the side posts, support the front of the berth, while allowing it to be doubled up when traveling.

The ceiling lockers are shown in Figs. 11 and 12. There are five of these, two at each side and one across the rear. The rear one is 12 in. wide, 3 ft. deep, and 6 ft. long, and easily contains all the spare bedding. The side lockers are not so large, and are used for clothing, and other articles in constant use. The method of framing the lockers is clearly shown in Fig. 6, Part I; each door is cut from a single piece of ⅜-in. lumber, and the edges bound with lattice strips. This makes a neat but light door. Thumb buttons or catches are used on the ends of each door to prevent rattling.



Left, Car Complete, Ready for the Road, with Berth Housed, and Windshield in Place; Right, Windshield Open, Berth Down, and Duck-Covered Frame in Position for Sleeping

The combined refrigerator and table, Fig. 16, is made throughout of ⅜-in. soft wood. Wide boards were used so as to minimize the number of joints necessary. The entire box, with the exception of the small cupboard, is made with a double skin, ⅜-in. strips being used to separate the boards. The lids are of the same type of construction; this insures fairly good insulation. The ice is set in through the large top door, and rests on a slatted frame at the bottom, just over the drain. The ice compartment is lined with galvanized iron, and the drain pipe is run through the floor. A sliding shelf or rack (not shown) is also fitted in this compartment. The small cupboard is built with but a single thickness of lumber, and has no connection with the main compartment.

A table leaf is hinged to the front of the box, supported by two ⅛ by 1-in. steel braces. The leaf itself is made from a single piece of ⅜-in. poplar, 16 in. wide, and is strengthened by three cleats.

The supply cupboard, shown in Fig. 17, is also made of ⅜-in. stock, except the top and shelves, which are made from flooring boards, to insure strength. The construction is clearly shown in the drawing.

The cooking-utensil cupboard is built to fit the space between the supply cupboard and one of the overhead lockers. Its position is shown in Fig. 11, and its construction in Fig. 18.

The gasoline stove is mounted on the supply cupboard, as shown in Fig. 11. This is the standard type used for home cooking, but several inches are cut from the bottom, and all joints carefully riveted. A vacuum tank is used instead of the reservoir originally furnished. Connection from this tank to the stove is made with 5/16-in. copper tubing; the supply line is connected to the rear gasoline tank, which is filled with high-test gasoline. A small vacuum pump is connected to the vacuum line at the top of the tank, and a few strokes of this will fill the tank with gasoline, so that no fuel is ever handled in open vessels to supply the stove.

The water tank, Fig. 12, is of 30-gal. capacity, and is set on the floor at the

rear of the car. A ¾-in. pipe is run, under the floor, to the rear of the car, where it is fitted with a tee. The side outlet is fitted with a 16-in. length of pipe, the upper end being capped; this is the filler pipe. The other opening in the tee is fitted with a regular faucet; both filling the tank and drawing water are done outside the car. This tank may be made by anyone handy at sheet-metal work; it is made of 20-gauge galvanized iron, and is fitted with a center baffle plate, to prevent splashing. A pressure system, tried at first, proved to be too troublesome.

The tool box, Fig. 19, is made of 20-gauge auto-body steel, over a wood frame. The rear compartment, carrying spades, chains, rope, jack, etc., is reached from the outside. The front compartment, carrying small tools, is reached through a trapdoor in the car floor. In framing this box, the builder should remember that it is to be swung under the floor, and make the frame accordingly.

Four chairs are provided, one of which is shown in Fig. 20. They may be moved to any position desired, but to keep the driver's seat in position while traveling, as shown in the floor plan, Part I, it is furnished with metal toes on the front legs. These slip under staples or metal cleats on the floor, and make the seat quite secure. When the parts are framed and glued together, the webbing is nailed to the back; a small spring is then sewed on at each point where the webs cross. The springs are then tied in the usual manner, covered with burlap, the back padded with cotton batting or hair, and covered with material taken from an old touring-car seat. This can be secured at any car-wrecking house. It is also possible to cut sections of padding complete from old car-seat backs, and tack them in place. While this demands care, it is easier than building up the upholstery from the bottom.

The seat cushions may be made, in a similar manner, from old touring-car seat cushions, the upholstering material being first removed from the springs. A frame is then prepared that will fit loosely into the chair frame, and the old springs are fitted into this, wired, and tied in place, and the upholstering replaced.

The wheel housings must be made very tight, and mounted snugly to the frame, to exclude dirt. They are made of 20-gauge metal, wood-covered if desired, and all joints should be seamed, crimped, and riveted. Felt strips are used in the floor and side joints, coated with gasket cement, and screws used to draw the housings tight. The metal housings are quite strong enough to serve as seats, and cushions can be fitted to them. Dimensions cannot be given that will suit all cars, but the housings shown are 13 by 15 by 42 inches.

Two gasoline tanks are carried, both mounted under the floor, outside the chassis frame at the left front corner. The forward tank is used almost exclusively for the engine, although both are connected so that either may be used if desired. The rear tank carries enough high-test gasoline for a month's cooking, and is connected to the stove as previously described. Both tanks are of 15-gal. capacity.

The construction of the remaining few fittings, such as the instrument board, folding steps, etc., can be gathered easily from the drawings. Many other fittings could be described, but as the necessity for these varies with the builder, they will be omitted. The painting and finishing, which is also a matter of individual taste, need not be entered into here.

To those who contemplate building such a car, however, the following figures will be of benefit. The cost will vary, of course, and some small items, not purchased, are omitted; the main items of cost are included, so that the prospective builder will have a good estimate of his probable expenditure. The tires purchased in this list were put on last season, and are apparently good for at least another season. It will be noted that—as is to be expected—the item of cost is greatest in the case of the chassis. As this item may vary greatly, it is hard to estimate costs. The reader will understand that no labor charges are figured.

BODY AND CHASSIS COSTS

Lumber	$ 59.12	Used touring car	$150.00
Duck	50.10	New wheels and rims	47.00
Glass	5.50	New tires and tubes	160.00
Paint	10.65	Steel	7.60
Steel	9.30	Materials for overhaul	28.05
Hardware	7.60	Shock absorbers	33.00
Shades	12.00		
Linoleum	14.00		
Stove and vacuum tank	11.00	Total	$604.92

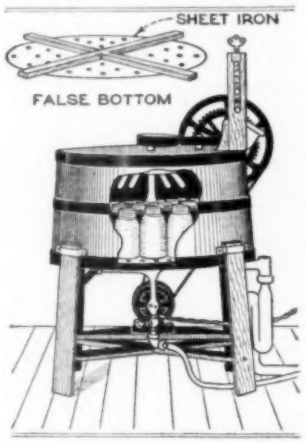
Cutting Brass Chemically

Brass can be cut in irregular shapes by a chemical process that is dependent on the amalgamating properties of mercury. The process will be useful when shears cannot be used, or when dies are too expensive.

Pencil in the design, then make a saturated solution of bichloride of mercury (poison) in alcohol, and use a fine brush to outline the design, avoiding overlapping of the pencil lines. After drying, the design should again be gone over with a sharpened stick dipped in nitric acid (poison). In a few moments the brass can be broken at the lines, like glass cut with a diamond.

Washing Machine Used for Canning

The illustration shows how an electric washing machine that has its own heater can be adapted to the canning of fruit or vegetables by the cold-pack method. A false bottom, about 19 in. in diameter, is made of ⅛-in. sheet iron, wooden cleats being bolted on the underside, and a number of holes drilled through it to allow proper circulation around the jars. In a tub that is 12 in. deep and 22 in. in diameter—the usual size—about 30 quart jars can be accommodated at once.

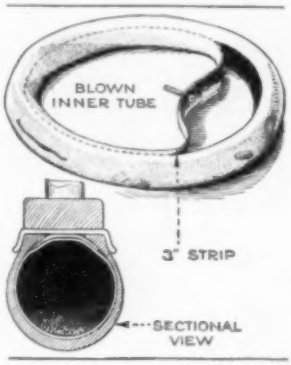


Soft-Focus Effects Produced with Small Camera

Soft-focus effects can be produced with any ordinary small camera fitted with a single lens, by cutting out the hard-rubber diaphragm in front of the lens until it is the full size of the lens tube. This increases the speed of the lens about three times, and has the effect of making the rays of light strike the film irregularly, and produce a soft haziness that is very pleasing. The negatives will stand a great degree of enlargement.

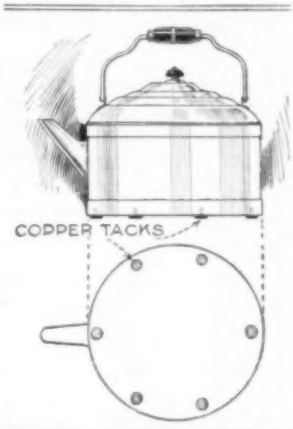
Protecting Inner Tubes from Rim Rust

Although occasional painting is an effective method of preventing rust on automobile-wheel rims, and thereby protecting the inner tubes, the paint soon wears off. A much better method is to use a continuous 3-in. rubber strip, cut from a discarded inner tube, and to place it between the rim and the inner tube, inside of the casing. The ordinary fabric flap is quite serviceable, if available, but is likely to absorb moisture, and thus cause rusting. Some motorists cement a rubber strip directly to the rim, and seat the casing beads against this, but the method shown is much easier to apply, and quite as effective.



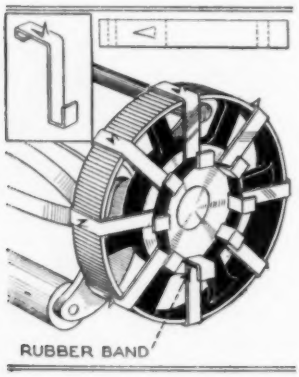
Mending a Copper Kettle

A copper kettle or pan usually wears through at the edge, owing to the constant moving on the stove. If merely soldered, the solder soon wears off, causing another leak. A better method of mending a kettle is to punch small holes in the bottom, around the edge, as shown in the illustration, and to drive copper tacks into the holes from the outside. After the heads are sweated to the bottom with solder, the point of each tack is clipped off and hammered down. The heads of the tacks will take all the wear when the kettle is moved, and thus save the bottom of the utensil.—J. A. Stevens, East Boothbay, Me.



Nonskid Attachment for Lawnmower

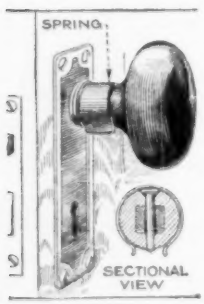
Where terraced fronts and other steep slopes are to be kept trimmed with the lawnmower, considerable difficulty is usually experienced in getting the machine to operate without skidding, especially if the grass is tender or wet.



This difficulty will be overcome by providing a pair of nonskid attachments, which can be made from heavy galvanized-iron strips and two heavy rubber bands. The iron strips are about 1½ in. by 6 in. in dimensions and the rubber bands are pieces cut from an old inner tube. Each iron strip is placed on a solid block, a V-shaped cut is made in it, as shown in the plan view, and the "V" is bent out at right angles. The strips are then bent to the shape shown in the upper left-hand detail. Eight pieces are hooked over each wheel of the lawnmower, spaced equally around the rim. They are held in place by a rubber band that is snapped over the ends of the pieces near the center of the wheel. With these attachments in place, the mower will not skid.

Repairing a Door Knob

It frequently happens that a door knob comes off, because the screw that holds it on the lock shank becomes loose or stripped, and falls out. If no screw that fits is available, the trouble can be overcome by using a short piece of a nail, held in place by a narrow strip of spring brass, bent to fit closely over the shank of the knob. If spring brass is not obtainable, ordinary friction tape or adhesive tape can be used instead. A pin, driven tightly into the hole, will also do the job, but is difficult to take out when it is necessary to remove the knob.

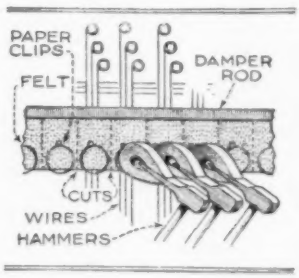


Locking Folding Typewriter Desks

Some folding typewriter desks, after a period of use, develop unwelcome characteristics, such as closing up unexpectedly—after the manner of folding beds. This annoyance can be prevented by the use of an ordinary sash lock, which can be purchased for a few cents at any hardware store. One part of the lock is fastened to the shelf and the other part to the side of the desk, so that when the desk is open the lock can be closed. The part attached to the side must, of course, be out of the way of the shelf when this is swung around in closing the desk.—A. C. Cole, Chicago, Ill.

Banjo Effect on Piano

Many upright pianos are equipped with a practice pedal—the center one of the three—which lowers the damper rod and reduces the volume of the tone. This device, which is seldom used by the average pianist, can readily be converted into an inexpensive banjo attachment.



A number of cuts, as indicated by the dotted lines, are made in the felt strip attached to the damper rod, so as to make as many "tabs," or sections, as there are groups of wires, each tab covering one group of three. A circular wire paper clip is then pushed on the end of each tab so that, when the damper rod is lowered, the clip will come directly under the hammer at the point where the latter strikes the wires. This will give the effect of a banjo when the keys are struck.—G. R. Brown, Bridgeport, Conn.

Hose Protects Foal in Stall

Stable space on the farm is often so limited that it is necessary to keep a mare and her foal in the same stall. This is rather dangerous, however, as it frequently happens that the foal becomes entangled in the mother's halter rope, and is strangled. As a precaution against this danger, a Wisconsin farmer slipped a 2½-ft. length of heavy garden hose over the halter rope, tying a knot at the end of the

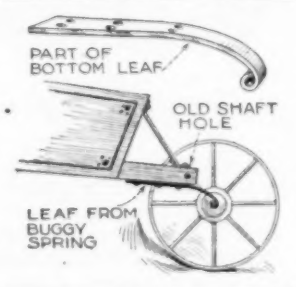
rope to keep the hose in place. When the rope is tied to the manger, the mare is not at all inconvenienced while feeding or resting, but the rope cannot loop, owing to the stiffness of the hose.—G. E. Hendrickson, Argyle, Wis.

Increasing Power of Wagon Brake

When heavy loads are hauled over steep hills by wagon, it is important to have adequate brakes. A contrivance that greatly increases the power applied by the brake consists of a strong stick attached to the brake lever, as shown, and fitted with a small pulley near the top. A rope is passed through the pulley; one end of the rope is tied to the wagon, and the other end goes to the driver so that it can be pulled to operate the brake. In this way greater force can be applied with less effort than usual.—M. W. Lowry, Athens, Ga.

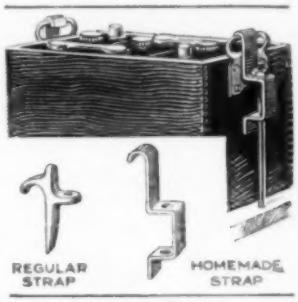
Equipping the Wheelbarrow with Shock Absorbers

The shocks suffered when pushing a wheelbarrow over rough ground can be largely eliminated by providing the wheel with shock absorbers made from buggy-spring leaves. The leaves used for this purpose have eyes at the ends; each is cut to a length of about 8 in., and has three or four screw-holes drilled through it. The eyes are reamed out so that they will accommodate the axle of the wheel and allow it to turn easily, and the springs are screwed to the underside of the wheelbarrow frame, the eyes being turned down.



Making Battery-Box Straps

When installing a new and different type of storage battery in an automobile, it may happen that the bolts used to hold the box in position are too short. Longer bolts can be used, in some cases, but these are not always easily obtainable. In this case, it is best to make a couple of new straps, from lengths of ½ by ⅛-in. strap iron. They are bent to the shape indicated in the drawing, and holes drilled through them for the bolts. Straps of this kind can also be used when the regular ones are lost.—F. S. Root, Fall River, Mass.

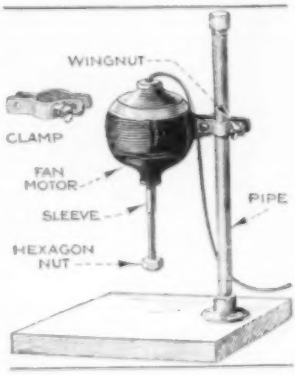


Homemade Electric Whipper

A homemade electric whipper, resembling those used on soda fountains, has been found useful as an egg beater, cake-batter mixer, and cream whipper. It consists of a small electric-fan motor, a length of ½-in. nickel-plated pipe, a clamp, and a hardwood base, arranged as shown in the illustration.

The length of pipe, which serves as a standard for holding the motor, is held by a floor flange, screwed to the base. The motor is fastened to the standard by means of a sheet-metal clamp, riveted to the motor, and clamped on the standard with a bolt and wingnut.

A short length of steel rod, of the same diameter as the motor shaft, is threaded on one end, a nut run on, and the end of the rod riveted over, to prevent the nut from unscrewing. The rod is attached to the shaft by means of a brass sleeve, made of tubing and soldered in place.—W. J. Laubenstein, Cleveland, Ohio.



RADIO-FREQUENCY AMPLIFICATION

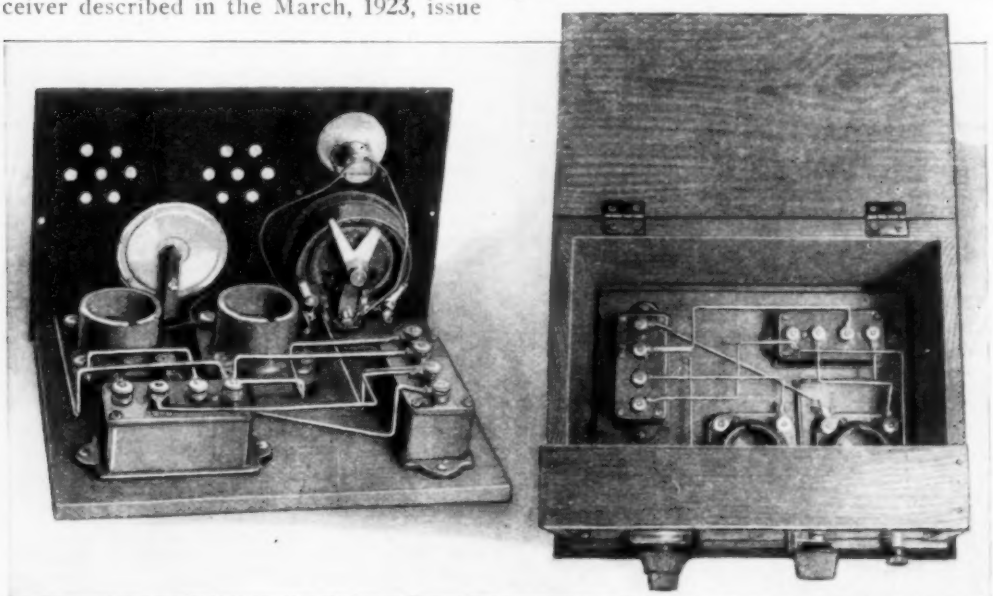
By F. L. Brittin

RADIO-FREQUENCY amplification can be added to any detector-tube circuit in a very economical and efficient manner by carefully following the directions given in this article. This process, as the name implies, is one of amplifying the signals at a receiving station while they are still at radio frequencies, and is therefore applied just before the signals reach the detector tube; this brings in distant stations, the signals of which are too faint to operate the detector tube.

In order to illustrate the method of adding the amplifier, the spider-coil receiver described in the March, 1923, issue has been selected; the same method can be followed, in any other tube circuit, by cutting the grid lead and connecting the amplifier as shown in the accompanying diagrams.

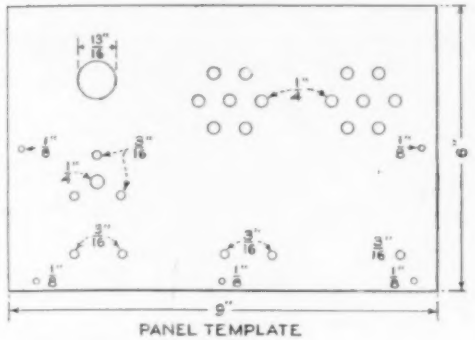
The template for the panel of the amplifier unit is shown in Fig. 1, and a photo of the front of the completed unit in Fig. 2. Fig. 3 shows the rear of the instrument, with all connections, and Fig. 5 how the instrument is set on the spider-coil receiver and audio-frequency amplifier. Note, in the wiring diagram, Fig. 4, the two posts marked "output," or C and D; two posts are placed on the detector unit immediately below these, and jumper connections are used, as indicated in Fig. 5. From the posts on the detector panel, connection is made to the grid circuit.

Connections are made, from the posts on the left front of the panel, to the detector-unit A-battery, and from a post on the right-hand side, to the high-voltage positive terminal of the regular B-battery. The connections, as may be noted, are thus extremely simple.



Left, Rear View of Complete Radio-Frequency Unit Removed from Cabinet; Right, Top View of Unit in Cabinet, with Lid Thrown Back to Show Wiring

The 1½-amp. ammeter shown on the panel is not essential, but is very useful for watching the amperage of the A-battery. Just below this instrument is a combination rheostat and potentiometer. The potentiometer was not used in this particular circuit, but was built in for use on other circuits; a plain rheostat is used on the second tube.



PANEL TEMPLATE

FIG. 1

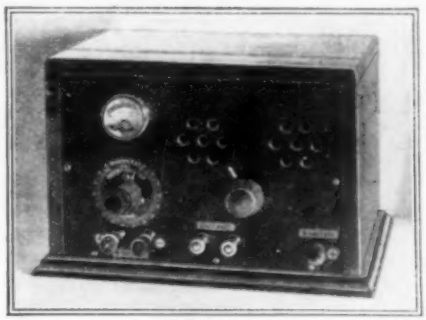


FIG. 2

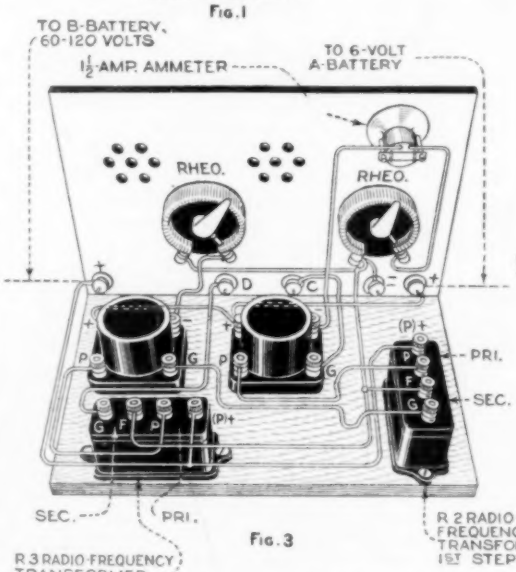
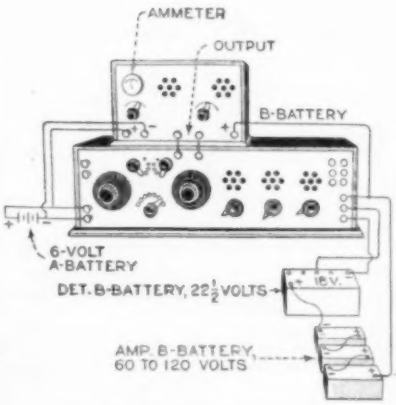
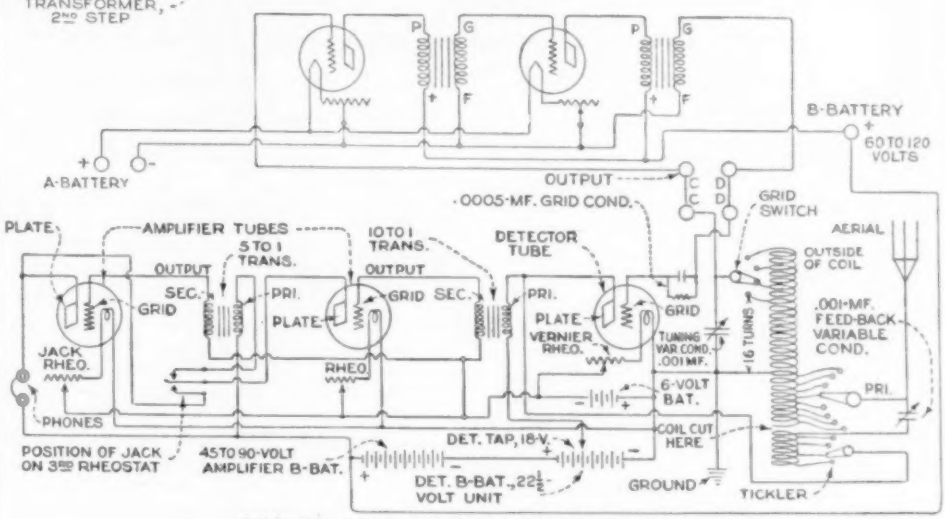


FIG. 3



ADDING 2 STEPS OF RADIO-FREQUENCY AMPLIFICATION TO THE SPIDER-COIL RECEIVER

FIG. 5



CIRCUIT DIAGRAM OF RADIO-FREQUENCY AMPLIFIER

FIG. 4

Figure 1, Template for Drilling Panel; Figure 2, Front View of Complete Instrument; Figure 3, Rear View, Showing Connections; Figure 4, Wiring Diagram of Radio-Frequency Amplifier, Detector, and Audio-Frequency Amplifier; Figure 5, Instrument Mounted, and Connections to Batteries

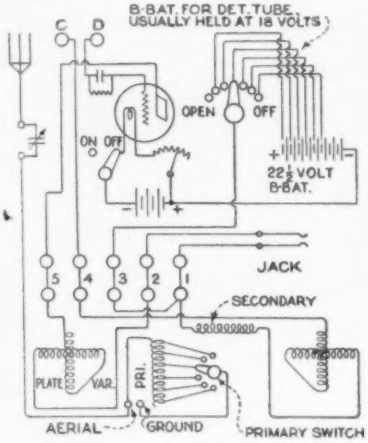


Fig. 6

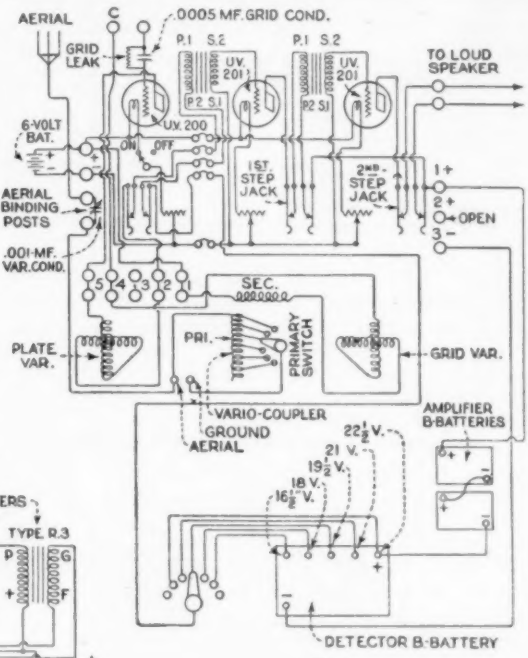
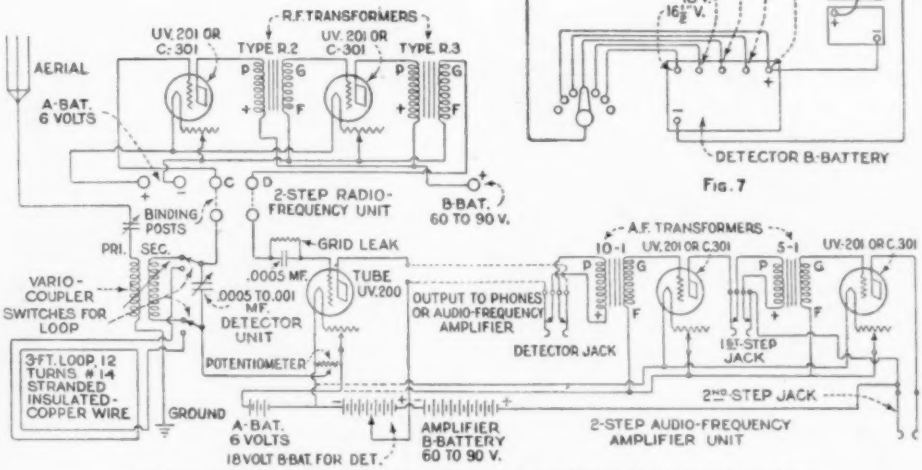


Fig. 7



METHOD OF ADDING 2 STEPS OF RADIO-FREQUENCY AMPLIFICATION TO ANY SIMPLE TUBE SET

Fig. 8

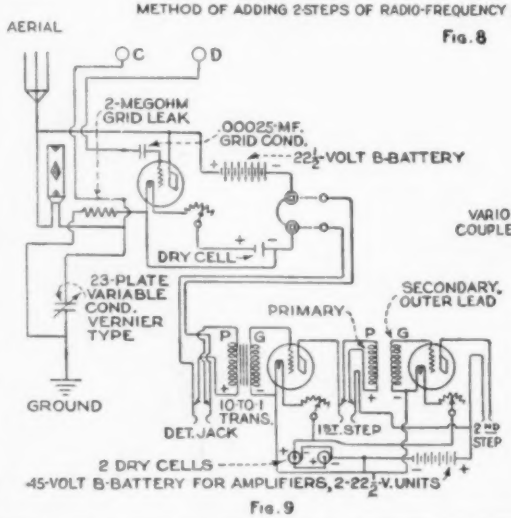
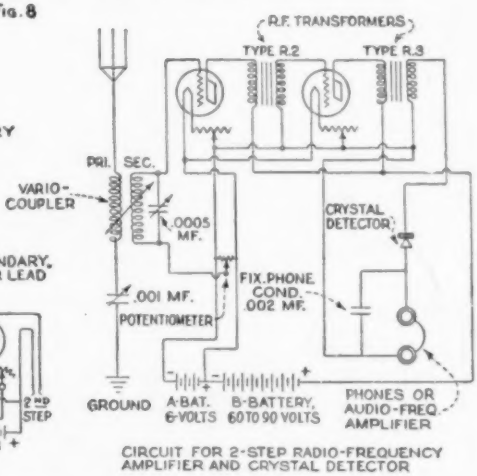


Fig. 9



CIRCUIT FOR 2-STEP RADIO-FREQUENCY AMPLIFIER AND CRYSTAL DETECTOR

Fig. 10

Figures 6 and 7, Connections for Regenerative Receiver and Two-Step Amplifier, June and July Issues, 1922; Figure 8, Connections for Instrument Described in November, 1922, and Figure 9, for That in June, 1923; Figure 10 Shows Connections for Adding Amplifier to Crystal Detector

The transformers used were selected for their ability to bring in the distant stations; for the first step, the type known as "R 2" is used; for the second, the type known as "R 3." Each transformer has its "peak" at a different wave length, preventing interstage "howling."

Busbar wiring, of square copper wire, is used for the connections to the transformers, all leads being made as short as possible. The filament wiring for the tubes is No. 14 tinned-copper wire, covered with varnished-cambric tubing. The tubes used are either the "UV. 201" or "C 301"-type.

When wiring, note that the lead from the B-battery positive post is taken to both the posts marked positive on the transformers. The post marked D, on the panel, is connected to the post G on the second-step transformer, and the post C, on the panel, to the grid terminal on the first-tube socket. The grid terminal on the second-tube socket is connected to post G on the first-step transformer; the plate post on the first-tube socket to post P on the first-step transformer, and the plate post on the second-tube socket to post P on the second-step transformer.

The rheostats are connected in the usual manner, except that the ammeter is in the circuit of the first tube. The use of the combined rheostat and potentiometer is advised with the circuits shown in Figs. 6, 7, 8, and 10, for best results. In these circuits, an extra binding post must be placed on the panel of the radio-frequency unit, and one on the detector unit, for the potentiometer-lever connection. The potentiometer resistance unit is connected across the A-battery posts, and the lead from the lever connected, through the binding posts and jumper, to one side of the secondary of the vario-coupler.

Figure 6 shows the method of connecting the radio-frequency amplifier to the detector set described in our June, 1922, issue, and Fig. 7, a wiring diagram for the set described in July, 1923. In Fig. 8 is shown how radio-frequency amplification may be added to the set described in November, 1922, with the addition of two steps of audio-frequency amplification, and a loop aerial, if the latter is desired. Figure 9 indicates the method of cutting into the circuit of the dry-cell tube set described in the June, 1923, issue, and Fig. 10, how radio-frequency amplification may be used on a crystal-detector set. In the circuit shown in Fig. 9, where dry-cell tubes are used, two dry cells, connected in parallel, will be necessary for the radio-frequency unit, in addition to the dry cells already in use. These cells are connected directly to the A-battery posts. In this set, dry-cell tubes must be used, of course, instead of "UV. 201" tubes. These diagrams will enable all of our readers who have built these sets to connect the radio-frequency amplifier to them without any trouble.

MATERIAL LIST

1 bakelite panel, ⅛ by 6 by 9 in.	$ 1.00	1 "R 2" transformer	$ 5.00
1 cabinet, with separate base	3.75	1 "R 3" transformer	5.00
2 tube sockets	1.50	1 1½-amp. ammeter	3.00
1 rheostat and potentiometer	3.00	5 binding posts	.60
1 rheostat	1.10	3 ¾-in. nickeled wood screws	.....
2 "UV. 201" or "C 301" tubes	13.00	2 ½-in. nickeled wood screws	.....

Replacing Reflecting-Camera Mirrors

Amateurs who are unfortunate enough to break the mirrors of their reflecting cameras find it hard to replace them, owing to the fact that the silvering is on the surface of the glass. Few workmen can silver these mirrors properly, or varnish the delicate surface to prevent tarnish.

An excellent method of replacing the broken glass is to obtain a piece of fine plate-glass mirror, and cut it to the proper size for the camera. Then soak the glass in denatured alcohol for at least an hour to remove the varnish on the silvered side, rubbing gently with the tips of the fingers until the silvering is clean. Wipe off gently with absorbent cotton wetted with alcohol.

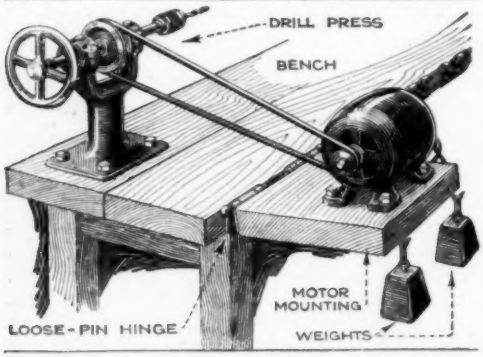
If the silvered surface is dull, obtain a small quantity of jewelers' rouge and polish the surface with this, rubbing lightly until an image is clearly seen on the surface. Then varnish with collodion or dilute negative varnish.

A method used by glass men to bring up the polish is to pour boiling water on the silvered surface; this can be tested on a small piece before trying a large mirror.—George Parke, Chicago, Ill.

¶The luminous tip of an old watch or clock hand, applied to the indicator of a gasoline-tank gauge, makes the use of dangerous lights unnecessary.

A Universal-Motor Mounting

A small motor used for driving a drill press, buffing head, and several other machines, was attached to the portable

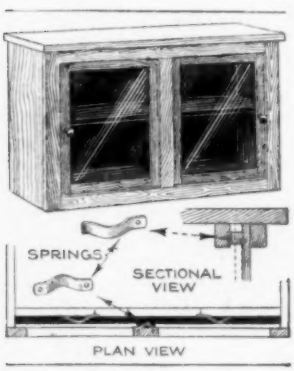


A Portable Mounting for Small Motor That Permits the Motor to be Used for Several Purposes: Loose-Pin Hinges Hold the Mounting in Place

mounting shown in the illustration. This consists of an oak board of suitable size, attached to the edge of the workbench by means of loose-pin hinges. The belt is slipped over the pulleys and suitable weights hung from the edge of the board to keep the belt at the proper tension. Wherever the use of the motor is required, hinge pieces of the same type are provided, so that the mounting can readily be attached to the bench or machine.

Novel Arrangement of Sliding Cabinet Doors

The drawing shows a novel sliding-door arrangement for cabinets. It differs from the usual kind in that the doors are in line with each other when closed, and thus present a much neater appearance than in the usual arrangement, where the edge of one door frame fits behind the other. The doors are kept in position snugly by means of flat springs located at the top and bottom of each door frame, as indicated, and pressing against the door frame. These springs are screwed to rails running across the cabinet, behind the doors. Similar springs on the center rail, between the doors, force the door that is opened to slide behind the other. —Gordon H. Sears, Salt Lake City, Utah.

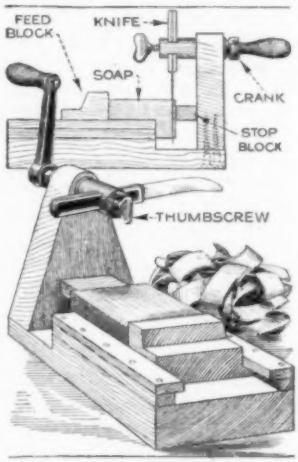


Mending Holes in Aluminum Vessels

A small hole in an aluminum vessel can readily be closed by mounting the vessel on a small anvil, shoe last, or some similar metal surface, and tapping gently around the hole with a light hammer. This will spread the aluminum sufficiently to close the hole. The pan should fit smoothly over the anvil, in order to leave as few marks as possible on the surface. If the pan is large enough, it can be hammered from the inside, the outside being placed on a flat metal surface.

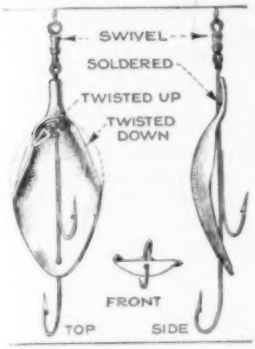
Simple Soap-Chip Cutter

A handy contrivance for use in the kitchen is a soap-chip cutter of the type illustrated. It consists of a base, the construction of which is quite clear from the drawing, provided with a sliding block to feed the soap to the knife. A stop block, screwed to the head and projecting close to the knife blade, determines the thickness of the chips. The whole device is made of wood, with the exception of the crank and cutter head, the latter being made of ⅝-in. cold-rolled steel, turned down at one end to fit the hole in the bearing, and having a slot and a thumbscrew in the end to hold a paring knife; the crank is either taken from a junk pile, or made of flat iron, and provided with a wooden handle. In use, the bar to be cut is inserted between the feed block and stop, and is pushed toward the head with the left hand, while the crank is turned with the right. The cutter may also be used for making potato and apple chips.—Frank N. Coakley, Buffalo, N. Y.



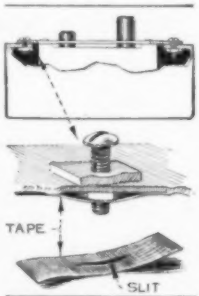
Making a Spoon Hook

A good spoon hook can actually be made from an ordinary spoon, with a rather small and shallow bowl, as shown in the illustration. Cut off the handle about ½ in. from the bowl, and drill small holes through each end of the bowl, in line with each other. Then push the shank of a long hook through the two holes and point the barb of the hook toward the bottom of the bowl, leaving about 1 in. between the two. Solder a second hook to the shank of the first, inside the bowl, as indicated, the barb of the second hook pointing upward and reaching nearly to the center of the bowl. Solder the short piece of the spoon handle to the shank of the long hook and attach a swivel to the eye. Twist one edge of the bowl down and the other edge up, and the hook is complete. Keep the outside of the bowl polished.



Tape Holds Inaccessible Nuts

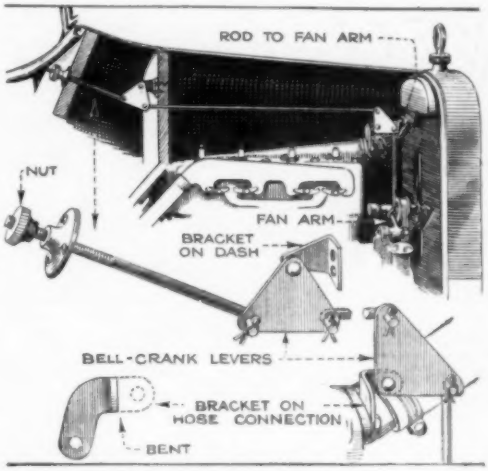
While installing a push-button switch, the writer was confronted with the problem of holding the small nuts in position while starting the cover screws. The switch plate itself closed the box opening, which made it impossible to hold the nut by hand or with any tool. The difficulty was overcome by using small pieces of adhesive tape to hold the nuts in position against the underside of the box top. A slit was cut in the tape to allow the screw to pass through after being started in the nut.



This simple kink will prove handy in many similar circumstances. The nuts should be tried on the screws to see if they fit easily. Ordinary friction tape may be used, but the adhesive tape used for mending purposes is much better.—Donald H. Palmeter, Port Huron, Mich.

Dash Control for Fan-Belt Tension

A cold automobile engine is wasteful of fuel, and erratic in operation when the throttle is partly closed. This may be noticed particularly when starting the engine. The higher the temperature of the engine—within safe limits of course—the more economically and smoothly it will operate, even with the throttle nearly closed.



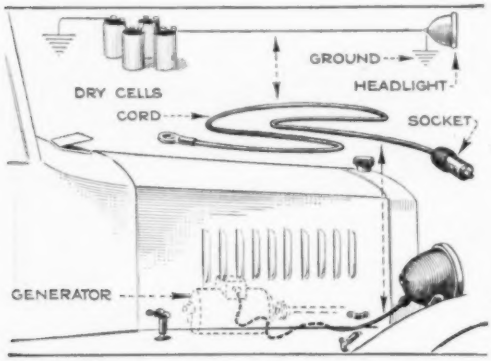
Above, Attachment Installed on Car; Below, Details of Bell-Crank Levers and Rods

In the greater number of water-cooled engines, the fan draft through the radiator is excessive, and causes the engine heat to be undesirably low at normal speeds. The fan, however, can be slowed down or stopped entirely with the attachment shown in the illustration. The bolt holding the fan arm is loosened slightly, so that the arm can be raised or lowered easily. A short length of 3/16-in. iron rod is hooked around the arm, and runs vertically to a sheet-metal bell-crank lever, held by a bracket on the hose connection. Another rod connects this lever to a second lever attached to the inside of the dash, and a short length of threaded rod extends from the second lever through the instrument board, passing through a metal flange, as shown. A nut is screwed on the end of the threaded rod, and is used to raise or lower the fan arm, thus tightening or slackening the belt.

A radiator thermometer is used in conjunction with this attachment, so that the latter can be adjusted according to the temperature of the engine. The water will, of course, evaporate faster when the fan is slowed down, but it is an easy matter to replenish the radiator.

Emergency Lights for Auto

Four dry cells, and a length of lamp cord fitted with a plug at one end, make it possible to use the headlamps when



In Emergencies, the Headlamps can be Used by Connecting Them to Four Dry Cells or to the Generator

these fail owing to faults in the regular wiring. The upper detail of the illustration shows a simplified diagram for the connections on a car having a one-wire electrical system. A two-wire hook-up is similar, except that both sides of the battery are connected directly to the lamp. The exact method of wiring will depend, to some extent, on the way the headlamps are wired on a particular car, but the same general principle applies to all cars.

Another method of providing light, without the necessity of carrying dry cells in reserve, is a single connection run from the generator to one of the lamps, as the trouble usually lies in the wiring, the switch, or the fuses, and not in the generator. It is a matter of only a minute or two to raise the hood, and to make the connection to the generator.—G. A. Luers, Washington, D. C.

Repairing Loose Plaster Ceilings

A practical and permanent method of repairing a loose plaster ceiling, without much expense or labor, is to panel it with wooden strips. Quarter-round molding should be put around the corners of the sidewalls and ceiling, and thin, narrow strips of pine, or any other suitable lumber, used for the panelwork. These strips should be fastened to the joists with screws; nails do not hold well, and jar the ceiling when driven in. All cracks in the plaster should be filled, and the ceiling should be given two or three coats of paint. The panel strips may either be stained and varnished, or painted. This makes a very neat-looking ceiling, and the work can be done for about one-quarter the cost of replastering.—Edgar Wright, Brookfield, Mass.

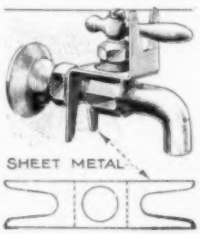
Campfire Photographs

The most delightful period of a camping trip is when all the participants are gathered around the campfire telling stories. If a camera has been included in the pack, the scene can be perpetuated for future enjoyment, with the operator included in the picture.

Place the camera in position, locating the scene properly in the finder by means of a torch, held by an assistant at the edges of the field included in the picture. Set the focus at the proper distance, measuring with a rule to be sure of its exactness. Then open the lens shutter, which should be set for time exposure, and sit into the picture. All the persons included should take natural positions, and should not all face the camera. A teaspoonful of flash powder, or a small flash cartridge with the top off, is dropped into the fire from the end of a stick, to give the necessary illumination and to make the fire show up. Too much powder should not be used, as it will make too large a light, and great care should be taken when handling the powder. After the exposure, the operator may get up and close the lens, as the light of the fire is too faint to affect the film.

Governing Flow of Faucet

In schools, factories, and public buildings, persons are often careless in the use of high-pressure faucets, splashing the floor or walls, and often leaving the faucet turned on "full bore," with the result that the waste pipe cannot carry the water away fast enough, and the basin overflows. The attachment illustrated will prevent this.



It is made of heavy sheet metal, cut to the shape shown, drilled at the center to fit the neck of the faucet snugly, then bent, and placed in position by removing the faucet handle. The faucet handle, when replaced, can only be turned a little more than the distance between the ears of the attachment, hence there is little danger of splashing or overflowing.

PRIZE OFFERS AND ANNOUNCEMENTS

NEW YORK ACADEMY OF SCIENCES OFFERS $250 PRIZE FOR 1923

A prize, known as the A. Cressy Morrison Prize for 1923, is announced by the New York Academy of Sciences for the most acceptable paper on any scientific subject covered by the academy, or by any of its affiliated societies. These papers must be the result of original research, never previously published, and must be submitted on or before Nov. 1, 1923. They must be typewritten with all drawings, diagrams, tables, and photographs, ready for publication. The award will be made by the council of the academy. The prize may be divided between papers of equal merit.

REWARD OF $5,000 FOR PREVENTIVE OF "KLIEG EYES"

Illumination experts and the medical profession in general are invited to devise a preventive for the affection known as "Klieg eyes," which afflicts motion-picture actors and others subject to the intense illuminating effects used. A prize of $5,000 is offered for the discovery. The affection takes its name from the studio lamps used in taking interior views. The intense light stops the natural secretion that "lubricates" the eyeball, causing the eyelid to rasp upon the former, with an effect like sandpaper.

ELECTRIC MINE-LOCOMOTIVE PRIZE OFFER

In order to bring out a safer type of mine locomotive, a prize of £1,000 has been offered in England for the best engine of this class. It must be an electric machine, run with storage batteries, for replacing ponies used in deep and hot coal mines. The prize is open to the whole world, and working trials will be made of those machines selected for test.

PRIZE FOR LOW-POWERED AIRPLANE FLYING LONGEST DISTANCE

To encourage the development of small airplanes, a prize of £1,000 has been offered for the longest sustained flight made in a low-powered machine. The engine rating of competing planes must not exceed 7½ horsepower, and only one gallon of fuel may be carried. Not less than 50 miles must be covered under these conditions. The competition is open to the world, and will take place in England next September. A second prize of £500 is offered which is restricted to British competitors.

LARGE PRIZES OFFERED FOR VERTICAL AIRPLANE FLIGHTS

Various prizes, totaling £50,000, have been offered in England for the first flier who can raise his machine vertically in the air. The chief conditions are that the machine must carry a pilot, one hour's fuel supply, and 150 pounds of extra load. It must rise straight up from the ground for 2,000 feet, and then come down to the starting point without damage. Other tests require the machine to stay 2,000 feet up in the air without motion for a half hour. The prizes are open to the whole world, and entries must be received before April 30, 1924. Only one machine is barred, and that is now under construction.

YALE SCHOLARSHIPS, LOANS, AND AIDS HELP SELF-SUPPORT OF STUDENTS

Nearly one-third of the student body at Yale University is partly self-supporting. In order to assist the many students of limited means to secure an education, the university provides opportunities for self-support in various forms.

The most important are tuition scholarships and loans, which amount, according to the scholar's standing, to as much as 80 per cent remission of tuition. These are in three classes, namely, remissions of tuition to freshmen and sophomores whose classroom work and personal references fill the requirements of high character and personality; regional or family scholarships, maintained by alumni or other local associations; and prize scholarships awarded to upperclass men of marked scholarship ability.

Other forms of self-support open to students are: ushering, coat checking and ticket selling at athletic games, chapel services, concerts, and lectures; salesmanship of many kinds, from bookselling to life insurance; tutoring for both graduates and undergraduates; work for board, and work for room in New Haven; student agencies such as student suit-pressing clubs, student laundries, student bureau of accommodations, flower agency, picture agency, news stand, newspaper bureau, student typewriting, and others. The university also maintains a library from which textbooks are loaned to poor students free of charge, a loan furniture collection, and provides for the remission of infirmary charges.

SOAP CHEMISTS OFFERED FELLOWSHIP IN ANY UNIVERSITY

Candidates who possess the equivalent of a master's degree, and who wish to devote themselves to a purely scientific study of the cleansing action of soap, are given the opportunity of submitting their qualifications for an endowed fellowship in this work. The fellowship carries with it an allowance of $2,000 per year, and the successful competitor will be permitted to work at any institution in the country which is properly equipped for a study of this character. Studies will be limited to the fundamental principles of chemistry, physics, and colloids connected with the cleansing action of soap.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute. The Franklin medal is for workers in technology; the Elliott-Cresson is for original research work and invention; the Howard N. Potts is for important development of previous discoveries and inventions. Each award consists of a gold medal with a diploma. There are also a silver medal, and a Certificate of Merit awarded for meritorious discoveries, and cash premiums for certain work in optics.

Best Treatise Regarding Immortality: Prize $1,000; announced January issue, 1923; closes Dec. 1, 1923.

Awards to Further Science of Electricity: Medals and prizes, amounting in all to about $20,000; announced February issue, 1923.

For Best Work by American Chemist: An annual award of $25,000; announced February issue, 1923.

Names for Great Lakes Steamers: Two prizes of $50 each; announced February issue, 1923; suggested names must be submitted before the opening of navigation season in 1924.

Motorboat Race, Miami Beach, Fla., to Havana, Cuba: Prizes $10,000; announced March issue, 1923.

Essay on Economic Subject: Prize $1,500; announced March issue, 1923.

Pulitzer Prizes, Columbia University: For best work in various literary and journalistic lines; announced April issue, 1923; nominations of candidates must be made before Feb. 1, 1924.

Scholarships for War Nurses and Ex-Service Men: Numerous scholarships provided at colleges and universities throughout the country under the will of the late La Verne Noyes; announced April issue, 1923.

Most Practicable Device for Recording Mine-Shaft Signals: Prize of £250, or about $1,100; announced May issue, 1923; closes Sept. 30, 1923.

Prizes for Essays: Three yearly prizes of $2,500, $300, and $200; announced June issue, 1923; for articles on subjects relating to business development and the modern trust company; closes August 31, each year.

Our Bureau of Information will furnish addresses and further details

Boys' and Girls' Short-Story Contest: Two first awards of $160, and other prizes; announced May issue, 1923.

Greatest Benefit to Community Rendered by Women's Club: Prize, $1,000; announced May issue, 1923; closes Sept. 15, 1923.

Endurance Prize for Aerial Engine: Prize, 1,000,000 francs (normally about $200,000); announced June issue 1923; applications for privilege to compete should be in before Dec. 1, 1923.

Prizes for Essays on Purchasing Power: Three prizes of $1,500, $800, and $500; announced June issue, 1923; closes Sept. 30, 1923.

Students' Essays on Municipal Government: Prizes $250 and $100 for postgraduates; $100 for undergraduates; announced May issue, 1923.

SCIENCE NOTES FOR DAILY USE

DEADLY CARBON-MONOXIDE GAS FROM ORDINARY GAS RANGE

Incomplete combustion of coal gas, natural or artificial, in domestic heating appliances, is the most frequent cause of carbon-monoxide poisoning, which often results in death. Since the pressure under which gas is delivered from the mains varies from time to time, the proper proportion of air to gas also varies in the burner. For this reason it is never safe to leave even a well-adjusted burner operating for any length of time without suitable ventilation. Devices of the so-called "smoke consuming," "odorless," and "chimneyless" type are thus not free from danger, unless provided with a flue. The latter has been found to be the safest accessory of the gas range and essential if all possibility of poisoning is to be avoided.

BOILED BUTTER HELPS FATTEN BABIES

Addition of boiled butter to the ordinary skim-milk dilutions fed babies would appear to be better for the infant than the use of cream, a recent medical report states. It is asserted that boiling the butter for five minutes over a slow fire drives off more than 50 per cent of the fatty acids in the product and the infant fed with the butter-skim-milk solution seems more free of digestive disorders than when fed cream. A number to whom it has been fed experienced a uniform gain in weight of from 1 to nearly 2 ounces a day.

TREATMENT OF CLOTHING WITH ARSENIC HELD DANGEROUS

In view of the fact that there is almost universal legislation now in force against the use of arsenical mixtures, except in minute quantities, in foodstuffs and wall paper, as well as other commodities, the recently inaugurated campaign for the use of that poison in treating woolens to make them moth-proof has met with opposition on the part of scientists. It is pointed out that using even a small quantity of arsenic in solution to prepare the cloth against insects before being made up into clothing would be a source of danger.

Clothes thus treated, when brushed, might throw off the arsenic compound, polluting the air even more than the forbidden wall paper. An infant might be poisoned by sucking a piece of cloth, and skin rashes might result from contact with the clothing.

KNOWLEDGE OF VITAMINES, ESSENTIAL TO GROWTH, ON INCREASE

Rapid strides in the development of present-day knowledge of the chemistry of foods brought with them the discovery of the vitamine groups, which are now known to be essential to body growth. The three distinct kinds already identified are the so-called fat solubles, known as A; the water solubles, called B; and the antiscorbutic kind, known as C, whose assimilation prevents scurvy. Continued research along these lines has led to the practical identification of a fourth group, to be called D, which has antirachitic qualities; that is, tending to prevent the disease rachitis, or inflammation of the spine, commonly called rickets. Food scientists believe that there are a great number of as yet undiscovered vitamine groups, each having certain health-essential attributes.

CHEESE NECESSARY TO A BALANCED RATION AND AIDS DIGESTION

The diet of the American, according to a writer on foods, is one-sided, consisting mainly of grains and meat products. These foods, although they are a balanced ration of carbohydrates and protein, are lacking in calcium and other minerals, which are essential to a fully balanced ration, and to the proper nourishment of the human body. These elements are present in cheese, which is therefore a rich, concentrated food to every one and especially as an item in the diet of growing children because of the calcium, phosphates, and the growth-promoting vitamine that are contained in it.

Contrary to the popular belief, cheese is easily digested, and in fact has a marked influence in helping to digest the entire meal. It remains a little longer in the stomach than do other foods, but digests very quickly in the intestines.

BRAIN UNHARMED BY RAYS THAT KILL TUMORS

Physicians of the Memorial Hospital for the Study of Cancer and Allied Diseases have discovered that X-rays and radium rays may be used to kill tumors of the brain without any great danger of harming the brain itself. Because of the delicacy of the brain tissues, it has frequently been impossible to operate for tumor in the head.

It is well known that X-rays and radium rays are likely to damage the flesh exposed to them. But the hospital scientists have now learned that the cells of the brain resist the action of the rays more strongly than the cells of any other part of the body. This makes it possible to inclose tiny bits of radium in a platinum capsule and insert them in the brain, the rays being strong enough to kill the tumor tissues but not strong enough to hurt the brain cells.

"MYSTERIOUS" CURE FOR SEASICKNESS IS SEAWATER

Passengers on ocean-going liners have heard rumors of it and some have had prescribed for them a certain "mysterious" remedy for seasickness, claimed to be sovereign. It now appears that the cure is simply a glass of seawater.

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